SOIL CONSERVATION

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SOIL CONSERVATION

Index

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SOIL CONSERVATION SERVICE

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VOL. XX—NO. 1

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

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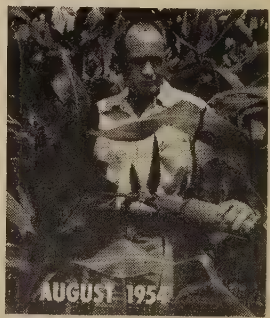
LUMBERMEN LEASE GRAZING RIGHTS.—In the Midstate Soil Conservation District, Oreg., a large lumber company, Brooks-Scanlon, Inc., has leased the grazing rights on a 40,000-acre tree farm to adjacent livestock operators. This is believed to be one of the first times that a timber company has recognized the value of dual use of forest land and made grazing available to an organized group of neighboring ranchers.

Nine of the ranchers adjacent to the tree farm organized the Bull Springs Cattle Association, with John Weber, pioneer Tumalo rancher, as president. Brooks-Scanlon then leased the grazing rights to the association, stipulating that the grazing program follow a range conservation plan developed by Soil Conservation Service technicians assisting the district. This plan is based on a complete range site and condition survey of the area and includes recommendations for fencing, rotated-deferred grazing, water developments and proper salting.

(*Continued on page 11*)



FRONT COVER.—Irrigated corn on the farm of Olin Helms, Route 1, Lancaster, S. C. Water comes from a nearby farm pond. The pond and irrigation system were laid out by SCS technician John Nisbet. The water flows by gravity from its source above the field. The day that J. B. Earle made this photograph a fisherman had caught a nice string of fish in the pond. Crops on the rest of the farm were parched from heat and drought when the picture was taken.

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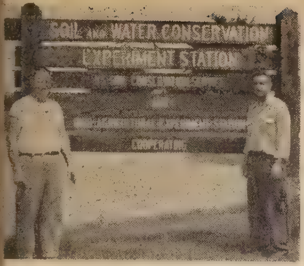


Sign, flanked by Osterson (left) and Taylor.

Training Center At Coshocton

Here in Ohio the Soil Conservation Service provides a unique and effective field training facility to develop its newly recruited technical employees as practical soil conservationists.

By WESLEY D. BASHORE

SOONER or later, most men entering the Soil Conservation Service in the Midwest and Northeast spend or will spend a month or so at the SCS Training Center near Coshocton, Ohio. They go there after several months in the field getting an idea as to what their job is and as to what problems will confront them. The sessions at the Center tie together all the loose ends that a man gathers during the first few months on the job.

"We're not trying so much to train the men technically," says Harrison "Doc" Taylor, training center supervisor, "as we are trying to put the tools together in proper balance as a science of soil conservation. We don't want one man to overdo his specialty—we try to balance all the technical fields. And we constantly point out that the farmer and his desires and farming systems are essential points of consideration."

The trainees are given a taste of every field involved in soil conservation. If one confesses ignorance of some field, he's given reference material so he can fill in the blanks.

"We take the attitude that a fellow is here to learn and will try his best to do so," Doc says. "We've been right almost every time. The training center isn't run competitively, where one fellow is pitted against another for grades. They learn far more by joint discussion.

"Soil scientist and engineer sweat it out in each other's fields. Some engineers confess surprise at learning that the soils field is so exacting. And all trainees become more appreciative of the mass of intangibles that the farm planner works with in his dealings with the farmer."

Men with different backgrounds and from different states are paired. This is for the purpose of broadening their horizons—preventing them from getting the idea that conservation is solely comprised of what they are doing and what their district is doing. Meeting and living with men from many states broadens and coordinates the program of the service.

There are innumerable tools of learning. Books, of course. And monoliths for learning

Lloyd Harrold explains tape on lysimeter scale showing variations in moisture contained in the plot of earth above.

soil characteristics, and grass root exhibits to illustrate the tonnage of organic matter. A big scale, to illustrate productivity balance. Instruments of many kinds. Charts, models and slides on everything from soil structure to proper handling of the instruments of the job.

One of the most closely observed pieces of equipment for learning is the hydraulic channel model—the only one of its kind in use outside the laboratory, according to Taylor. By changing water velocity and grade, the channel illustrates energy buildups of water on a slope and the effects of various types of control structures on flow. The model was developed by Fred W. Blaisdell, of Minnesota.

Trainees study soils at station.

Running close competition in interest, however, are the lysimeters of the Coshocton Soil Conservation Experiment Station. These widely publicized blocks of earth, one five-hundreth acre in size, afford the trainees new insight into the relations of soil, water and crops. The equipment is so finely adjusted as to be capable of measuring the weight of the dew.

The Center is ideally located. The entire experiment station is at the feet of the trainees and they take full advantage of it. The station's experiments and their application to the men's everyday work are effectively explained by the station director, Lloyd Harrold. The station offers excellent opportunities for the men to observe infiltration, contouring, stripcropping, woods management, the mechanics of water and its control, and many other conservation practices.

The men get the best possible instruction. Taylor, Osterson and Harrold are full-time

Experience in use of level.

Contour fencing experiment at station being described by Harrold and Taylor.

residents. Other SCS specialists from outside the area instruct the trainees in their own special fields.

The trainees get classroom instruction, then put their new knowledge to work on nearby practice farms cooperating with the Center, and on special field problems. Considerable time is spent in these field exercises. Sessions are often held in the evening, but you seldom hear any complaints about the load.

Even recreation is sometimes related to the course. There are weekend trips to Malabar Farm, the Muskingum watershed, the famed Cosmos Blubaugh farm, and other interesting sites. But, of course, the men do have to let off steam once in a while and baseball, volleyball, horseshoes, croquet and cards are favorite pastimes. When the season is right, the Center organizes a baseball team and plays Coshocton City League teams. "We're probably the only outfit around that loses a good ball team every month during the summer," Doc comments.

All the trainees take part in a safety program. A daily safety report is submitted and suggestions are made for improvement. Once in a while these suggestions take a twist such as this: "Carry soil augers properly, in order to prevent damage to the auger as it gouges an eye."

Harrold shows trainees how runoff is measured.

Because so much of their future work is in human relations, the men get training in public speaking, particularly extemporaneous. Each group has a Conservers Club, patterned after the widely-known Toastmasters Club, in which each trainee is required to give short speeches during his few weeks at the Center. One quick-thinking trainee was told to give an extemporaneous 1-minute talk on "My Most Difficult Task." He rose and spoke interestingly on why he found public speaking most difficult.

The Center is all under one roof. The classroom is in the spacious basement, the dining hall

and lounges on the main floor, and the dormitory and guestrooms on the top floor. Quarters are comfortable. Maintenance, board and dormitory are managed by the Association of Government Employees at the station, which pays a fee to the Government for use of the facilities.

Trainee gets experience talking on his feet.

Harrold and trainees at stacked silage pile.

Osterson points out effects of a straight overfall with a level approach floor in the hydraulic channel model.

Special sessions are sometimes held for foreign trainees. Their letters indicate high regard for the training they received and which was possible nowhere else. They have come from Brazil, Colombia, India, Pakistan, the Philippines, and other countries. An agricultural engineer from Sao Paulo, Brazil, wrote: "I want to suggest that every foreign student to be trained in conservation must attend first a period of training in this Center because here is the place to learn the basic principles of soil and water conservation."

Two types of sessions are held—one for subprofessionals, who are trained in the techniques of running a level, staking contours, and building terraces. The other is for professionals, those who are professionally trained in soil conservation and related fields but are new to the Service and need tooling up.

Sometimes—when a subprofessional becomes eligible for professional status and returns to the Center for additional training, he acquires a highly descriptive label—"Retread."

Some of the older fellows come to the sessions somewhat skeptical. "Why send me here?" they ask. But practically all of them, after a couple weeks of training, discount their earlier attitudes. Once in a while one of the younger fellows gets homesick—like the one who drove home to Missouri and back on one weekend. But usually the work keeps them so busy that they have little time to brood.

Some men get more out of the sessions than others. One trainee, in his spare time, met a girl in Baltic, a small town nearby. The others didn't know how he found time for courtin', but he came back the following year and married her.

Trainees like the course, feel that it is of vast help in getting them off to a good start, wish that it could be longer.

A moment of recreation between sessions.

Dollars Grow on Reclaimed Land

Here is a factual cost-accounting of flood control along the Colville River.

By DEAN M. JONES

SOME 4,088 acres of farmland along the Colville River, in Washington, have been reclaimed since 1942 by flood control practices in the Kettle-Stevens Soil Conservation District. Thousands of additional acres have benefited partially or indirectly.

Total cost to December 1953 was $116,886. Of this amount, farmers paid $69,579 and the State, on a matched fund basis, $32,655. The balance of $14,652 represents engineering and other technical services furnished by the Soil Conservation Service.

The accomplishments include river channel realinement, removal of brush and trees, removal of sandbars to eliminate congestion of floodwaters, smoothing of spoil banks, and diking and riprapping for protection of river banks. There has also been considerable supplemental ditching to improve both surface drainage and seepage on lands adjacent to the river.

Preliminary work began in 1942 with the organization of the Kettle-Stevens district. Within the district's framework are 8 flood control associations formed by groups of farmers having common problems and varying in number up to 18 members.

The Dollar Lake Association, organized in 1943, consists of the following: G. H. Oakshott, Mrs. J. G. Morrison and Dale Morrison, Alvin Miller, Rene Dubois, H. E. Buchanan, Mildred Rhodes and Grace Hartigan, Grancy Rhodes, and Louis Strauss. The area known as Dollar Lake is located just west of Colville. Improvement has consisted of blasting 7,720 feet of ditch and shaping the banks. The cost was $1,377 and direct benefit resulted to 300 acres of land.

The Deer Lake Association organized and began work in the south end of Stevens County near Loon Lake in 1943. A ditch 8,900 feet in length was blasted to improve surface drainage. This job cost the farmers $1,575, and directly benefited 368 acres of land.

Looking north from Oakshott bridge on Colville River. Overhanging trees, brush and other debris restrict water movement, adding to flood hazards. The other view shows the same area after dredging. Channel has been widened, deepened, trees and brush removed, free movement of water permitted.

Note.—The author is work unit conservationist, Colville, Wash.

Dollar Lake drainage ditch enlarged by blasting. The "after" picture shows the banks shaped and seeded.

The landowners in this group were: D. E. Gardner, W. Worthington and R. L. Sanders, C. W. Oberg and R. W. Gardner.

The Twelve-Mile Association, consisting of 6 farmers, R. N. McLean, Ed Lorentzen, R. M. Skidmore (Monahan estate), Arthur Ott, H. C. Fuller, and Lester Brownfield, 12 miles south of Colville, was organized and began work in 1945. The job included river realinement and channel clearing. The work was completed in 1949 except for continued minor improvements. The cost to this group to date has been some $29,000, and 529 acres of productive land have benefited directly. In addition to 4½ miles of river-channel improvement, supplemental flood control work was accomplished on 1,320 feet of Stranger Creek to relieve flood hazards of adjacent lands.

Ten farmers just west of the town of Valley organized the Valley Flood Control Association in 1948 for the purpose of improving 4 miles of river channel. They were John Tubbs, Donald Kilmer, Albert Kulzer and Walter Beck, R. J. Waldron, J. E. Potter, T. H. Hurbi, L. J. Davis, Ralph Hafer, and Edward Kilmer. Improvements consisted of realinement, deepening, widening and bank reshaping of the Colville River. Completed in 1948, this work cost $14,120 and benefited 711 acres of land. In addition to this, 2,640 feet of supplemental ditching was done.

In 1949 the old Dollar Lake project was reorganized to include all farms lying adjacent to the river for a 5-mile reach just west of Colville. The Colville River Flood Control Association is composed of the following landowners: G. H. Oakshott, William Huguenin, Earl Seitters, Grancy Rhodes, Mildred Rhodes and Grace Harrigan, Fred Herdrick, Walter Woods, Earl Sherrodd, Robert Wimmer, William Bronson, Louis Strauss, Nelson Brothers, Fred Draper, Mrs. J. G. Morrison, Rene Dubois, H. E. Buchanan, Stanley Morris, and Earl Gibbs. The 5 miles of river channel improvement cost $30,000 and 1,500 acres of land were helped. Annual maintenance includes removal of sandbars and other debris, riprapping and diking weak points, and removal of sand and gravel washed in by feeder streams.

The Arden Flood Control Association was formed in 1948 by 6 landowners: E. O. Rosenberg, Glen Baird, M. W. Burnett, Fred Ashely, Ed and A. L. Penzig. Channel improvement began in 1950 and was completed in 1951. This project directly benefited 400 acres of land, at a cost of $11,600.

In 1951 A. B. Lind set up what is known as the North Addy Flood Control Association to extend the work of Twelve-Mile project southward to the bridge at Addy. The improvements, including primarily a realinement of the Colville river channel, benefited 50 acres of land at a cost of $4,600.

The Addy Flood Control Association was organized in 1951 to extend river channel improvements southward from the North Addy project and includes the following landowners: Evald Peterson, Van Griffin, Victor Helt, W. L. Philpott, and Harold Major. Dredging operations have been completed through 4 of the farms and disposal and leveling of spoil banks has been accomplished on 3. There have been 3 farm bridges constructed and 2 lateral drains to a low area adjacent to the river. To date the job has cost $9,962 and when completed it will directly benefit 230 acres of land. It is

anticipated the project will be finished this year at an additional cost of approximately $2,500.

While there is yet much work to be done in flood control along the Colville River, the improvements already made give encouragement to the belief that virtually 100 per cent control eventually can be accomplished.

A sluggish, meandering stream with snake-like bends and brush-grown banks forming bottlenecks at many points, has been transformed into a relatively straight channel having greater capacity and accelerated flow.

The Colville Valley is about 20 miles long and varies in width from a few hundred feet to 3 miles.

The Twelve-Mile project was the first job requiring use of heavy equipment. The Soil Conservation Service made available a new half-yard gasoline-powered combination shovel and dragline in 1945. The district, in turn, leased the equipment to cooperators. In 1949 this piece of equipment was granted to the district and traded in on a new 5/8-yard machine now in operation.

The per acre cost of the work varies from one project to another, depending on conditions. The overall costs, however, have amounted to a relatively small sum compared with the good accomplished. The $102,234 spent on all projects has averaged $25 per acre of land benefited. This cost includes $32,655 or approximately $8 per acre contributed through the State Department of Conservation and Development on a matched fund basis. The engineering and other technical services furnished by the Soil Conservation Service, amounting to $14,652, averages $3.60 per acre.

The 4,088 acres brought into full production, therefore, cost the landowners $17 per acre, the State $8 per acre, and the Federal Government, through the Soil Conservation Service as cooperating agency $3.60 per acre, for a total of $28.60 per acre.

It is only fair to state that only those jobs starting after 1948 participated in matching State funds. The projects of Dollar Lake, Deer Lake, and approximately $20,000 of Twelve-Mile, were financed entirely by farmers themselves. It should not be assumed, either, that all the 4,088 acres were totally recovered by the operations. There were, however, substantial benefits to thousands of other acres. Should we but estimate a 75 percent benefit to the 4,088 acres, on the basis of 40-bushel wheat, we find an annual increase of 122,640 bushels, amounting to an annual gross return, at $2 per bushel, of $245,280. The formerly waterlogged lands have been converted to grains and hay or pasture, and under good conservation practices will gross that much or more, depending on the use, kind and management of crops grown, whether it is $20 hay, 75 percent butterfat or 25 cent beef.

The foregoing analysis should serve to emphasize that farmers working together through soil conservation districts, whether as individuals or as groups can, and do, manage their affairs for better use of land and water resources and to their direct profit.

Colville River below Palmer Siding bridge showing sandbars and restricted channel. Companion picture was taken from same point after dredging. Sandbars have been removed and channel enlarged to provide increased capacity.

Science Builds Up Timber Volume

Trees sometimes constitute the best conservation practice on fields worn down by other crops.

By CHARLES A. CONNAUGHTON

KEPTICISM has had to take another low bow to scientific fact.

Consider the case of the Winn district of the Kisatchie National Forest in Central Louisiana, for which a new management plan was recently approved by Washington headquarters of the U. S. Forest Service.

In submitting the first management plan in 1940, the regional forester had described the Winn unit as heavily cutover, with tag ends from old logging operations, immature young stands, patches of oldfield timber, and barren areas providing little encouragement to the lumber producers of that era. In that plan, only about 11,000 of the total 167,000 acres had pine stands that were considered saleable—119 blocks, two-thirds of which were less than 50 acres each.

Looking at this area then and remembering the big yields of virgin timber these areas had produced, skeptics shook their heads. "Sustained yields?" they questioned. "How can such management pay dividends?"

The facts brought out during a 1952 survey, on which the current timber management plan is based, indicate, however, that such management does pay dividends. Based on the plan's estimate that the timber carrying capacity of this land should average 8,000 board feet per acre, and that a subsequent boundary realinement has reduced the net area of the unit to 161,240 acres, the following facts are outstanding:

The volume of sawtimber which the Winn District could carry continuously is more than 1¼ billion board feet.

Note.—The author is regional forester, U. S. Forest Service, Southern Region.

The volume of sawtimber on the Winn District during the 1939 survey was 281,247,000 board feet, 21 percent of capacity.

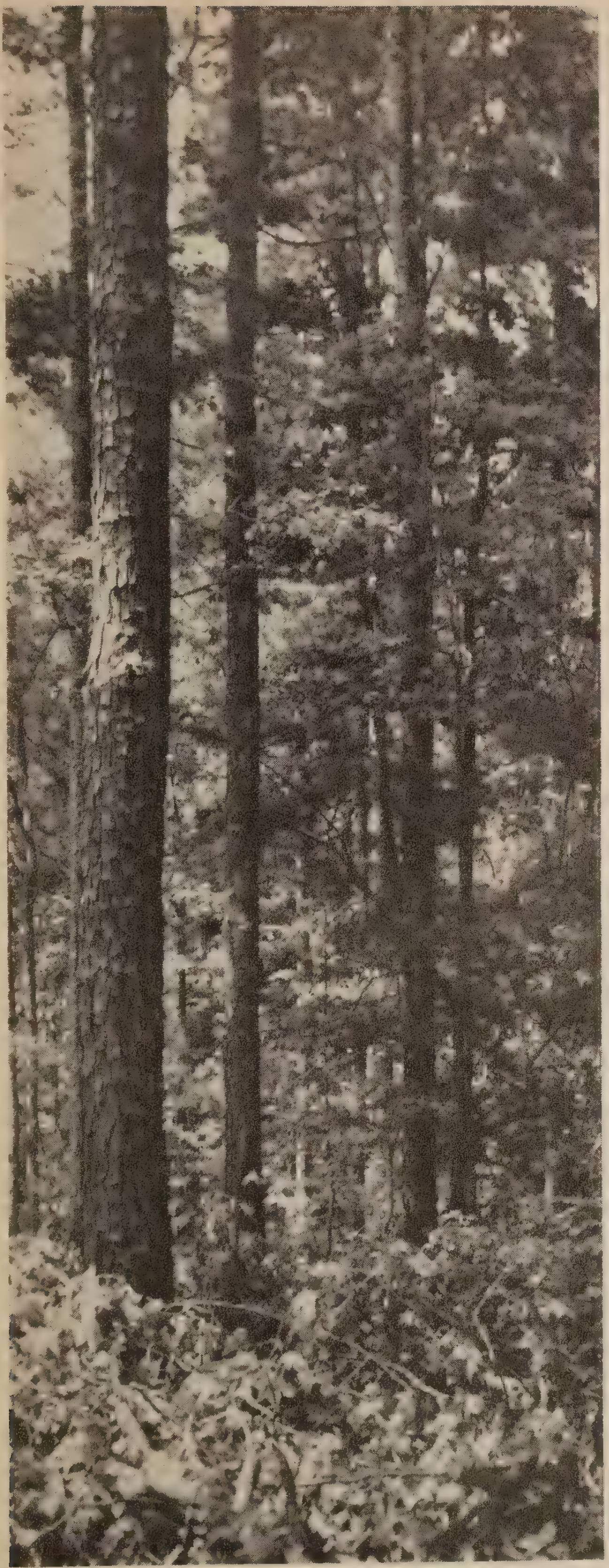
At the time of the 1952 survey, the Winn District was carrying 837,831,000 board feet of sawtimber, 65 percent of the growing stock goal.

In addition to that volume increase, 147,611,000 board feet of pine, cypress, and hardwoods were marketed from the unit during the 13 years between 1939 and 1952. That includes not only saw logs, but also pulpwood, poles, veneer, and all other products.

By 1956, the foresters estimate the volume of standing timber on the Winn unit will have reached 916,623,000 board feet, 71 percent of the estimated capacity.

This 4-year gain of 78,792,000 board feet of sawtimber will result, according to the plan, from cutting only 58 percent of the total growth during that period. On an average acre, that means the estimated growth each year would be 291 board feet; but, since 169 board feet would be harvested from that acre each year, the growth gain would be only 122 board feet annually—a total of 488 board feet per acre for the plan period of 4 years.

That average per acre, per year increase of 291 board feet in sawtimber volume results not only from growth on trees already in the sawtimber class, but also from volume added by young trees growing into that class each year. It does not include an additional growth volume on trees still in pulpwood size, measured in cords. Total annual growth volume during the plan period will average nearly 6 percent of the stand volume.



Oldfield stand of loblolly pine under management, Winn Parish. The field was last cultivated in 1909.

Thus, this representative segment of a national forest shows steady advancement toward maximum production from a status of more than 75 percent depletion, and the Winn District continues to furnish raw materials for local industries. During the 13-year period from 1939 to 1952, the average annual cut from the unit was 11, 355,000 board feet.

During the current 4-year period, it is planned to harvest 154 million board feet of sawtimber, pulpwood, poles, veneer, and other products—more than during the entire previous 13 years. This is an annual average of 38,-500,000 board feet—more than three times the former average, but with no reduction in progress toward that goal of a billion and a quarter board feet of timber volume.

LEASE GRAZING RIGHTS

(Continued from page 2)

Brooks-Scanlon had for many years leased the area to non-resident sheepmen. Some cattle strayed into the area from nearby private and public ranges, but there was no organized use by cattlemen. Since the range survey and plan were completed in 1950, however, the company has been attempting to find a way of using its grazing resource to enhance the livestock economy of the neighboring ranches and community. The consumation of the lease, with the Bull Springs Cattle Association appears to have acieved this aim.

—J. F. Rogers, and W. R. Currier.

Obviously pleased with the plan for use of timber company lands by the cattle association: Tony Halter, chairman of the board of supervisors, Midstate Soil Conservation District; John Weber, president, Bull Springs Cattle Association; Hans Milius, forester, Brooks-Scanlon, Inc. (Photo courtesy of *Bend Bulletin*, Bend, Ore.)

Assistant Scoutmaster George Truitt collects topsoil and subsoil in which Scouts will plant beans and note comparative growth rates. Textural differences between topsoil and subsoil at this site were too slight for detection by blind boys.

Teaching the

By CLARK H. GLEASON and FRED W. HERBERT

"Hello, are you Mr. Gleason?"

"Yes, what can I do for you?"

"I am Reede Hardman, assistant scoutmaster of Troop 2 here at the California School for the Blind. The Explorer Scouts in our troop have voted to study for the Soil and Water Conservation Merit Badge. Can you help us?"

"Why, I don't know, I guess so. Let me think it over and call you back."

THE FOREGOING conversation took place at Berkeley early this year. Then Gleason called Herbert. "You know, Fred, this is a challenge we can't ignore."

"Did you say 'we'?"

"Yes, you and I. Let's tackle it!"

So we did. We started with 12 boys. We held 8 indoor meetings of about an hour each on 8 successive Tuesday nights.

At the first meeting the general nature of soil was described, what was happening to it, the need for conserving it. It was decided at the outset that the boys should participate as much as possible, so they were invited to ask questions frequently and we also quizzed them after discussion of each item.

At the second session the boys were grouped in threes, each group being supplied with four samples of soil in paper cups. These were sand, loam, clay, and peat. A jar of water was provided. At this juncture the boys were told how soil could be identified by picking it up, moistening it, and rubbing it between thumb and fingers. The evening was spent drilling the boys in the technique. Toward the close of the session, single samples were handed out to test the boys' ability to identify the soils without comparing them with others. They learned fast and showed a keenly competitive spirit.

At the third session the work of the first two meetings was reviewed and additional practice given in determining soil texture, as well as introducing a few intermediate soil types. Some of the boys became quite proficient in distinguishing rather closely related soils by this method.

Watersheds were then discussed by use of a homemade putty model. The boys ran their fingers across this to learn the relationship of rivers, subsidiary channels, hillsides, hilltops, and alluvial fans. A county relief map was also employed for explaining watersheds and other physical land features.

At the fourth meeting there was further practice and review as to what constitutes differences in soils, as to soil and water relationships, and particularly as to watersheds. To add interest, the model watershed had been completed to show subwatersheds, adjacent drainages, and some "saddles" on the ridges. They were eager to run their hands over this new model. One boy brought a watershed model he had made of modeling clay which excited considerable interest.

At this session the hydrologic cycle came in for attention in connection with watersheds.

To demonstrate infiltration rates and water-holding capacities, a special apparatus was used, consisting of a half-gallon water bottle, fitted

Note.—The authors are forester, Forest & Range Experiment Station, U. S. Forest Service, Berkeley, Calif., and assistant state conservationist, U. S. Soil Conservation Service, Oakland, Calif., respectively.

l About Soil

Boy Scouts, though sightless, qualify for merit badge in soil and water conservation.

Larry Lazarini checks rate of water percolation in soil samples.

with copper tubing and two faucets, and mounted on a wooden box. Two baby-food cans were filled with soil to within a half inch of the tops, and one was placed under each faucet. One can contained sand, the other clay. The bottoms of the cans were perforated. They rested on wire grids. The faucets were turned on at the rate of about a drop a second. One boy verified this for the group. Small metal disks were laid on top of each soil sample to prevent splash. Another boy was selected to place his hands on the undersides of the cans and determine how long it took for the water to come through. The other boys were asked to estimate how long it would take. Some said it would take twice as long for the water to go through the clay soil; others said 3 times; one boy guessed it would be 10 times. Actually, it took the water approximately 4 times as long to saturate the clay as the sand, indicating the clay would hold considerably more water than sand. The water-holding capacities of soils, as affected by particle size and pore spaces, had been explained previously.

Explorer group. Soil samples in paper cups. Clark H. Gleason is at left, Fred W. Herbert at right.

After the soil in the two cans was completely saturated the faucets were regulated to allow water to go through each soil sample at the maximum rate without surface runoff. It was found that the sand took water three times as fast as the clay.

After these demonstrations, the boys were quizzed on what they thought was the practical significance of the test with relation to growing crops, such as what kind of soil they would pre-

Instructors and students discuss construction of log check dams.

fer to have for growing alfalfa under irrigation in a dry country. The answers to this and similar questions made it apparent that water-holding capacities, infiltration, and percolation were getting pretty well understood.

The first four sessions were designed to familiarize the boys with soils and their relationships, soil erosion and soil conservation. At the last four we concentrated on the requirements of the Boy Scout Soil and Water Conservation Merit Badge Manual for a merit badge in soil and water conservation. Practically all of the items in the manual were included. Where diagrams were called for we substituted verbal explanations and used the watershed model.

Under the "Do" items, we conducted a field trip. The boys were taken over a series of check dams and roadbank wattling established by another Scout troop. The work was described carefully. The boys got down on their hands and knees to feel the log structures, their spacings, the way the dams were tied into the banks, and other details. On this trip, differences between soils on sloping and level lands, and in open fields and woods, were noted. The boys were then divided into twos, each team filling one can with topsoil and one can with subsoil. Later, bean seeds were planted in each can and the boys noted their germination and relative growths in the two soils.

After the 8 sessions, the boys met individually with their counselors to take their final examination. Twenty-four questions were used. Of the 12 boys who started, 1 dropped out. Most of the 11 boys qualified with high grades. In fact, their ability to answer questions relating to all phases of the study and demonstrations was as gratifying as it was surprising.

Any apprehensions that these boys would be difficult to qualify for this merit badge were dispelled soon after we started working with them. They had the attitude that they could learn as well and as quickly as anyone, and they proved it. Demonstration devices, such as those described in this article, were very helpful. The course was facilitated by having two instructors who could alternate in talking and setting up and adjusting apparatus. This also heightened the interest of the boys.

(*Continued on page 23*)

DISTRICT PROFILE

VAN AKEN of MICHIGAN

A CLOSE working relationship with factors vital to a successful program of soil and water conservation—such as education, action, cost-sharing and credit—provides the background for Herbert Van Aken to use in connection with his local soil conservation district. His breadth of understanding has been recognized by the Michigan State Association of Soil Conservation Districts and by the National Association of Soil Conservation Districts in selecting Herb for special responsibilities.

Early in 1948 the farmers in Eaton County, Mich., created the Thornapple-Grand Soil Conservation District. Herb had been active in setting the stage for the district; consequently, he was elected to the original governing body, and at once became its chairman, a position he has held continuously ever since. He has recently been reelected to a 3-year term and again made chairman.

Under Herb's administration the Thornapple-Grand board launched an educational and action program that has continued to build momentum with each passing year.

This year's work plan calls for sponsorship or district participation in 26 activities. The most impressive feature is the willingness of the directors to assume individual responsibility. Briefly, the plan includes work with rural schools, the Boy Scouts, Vo-Ag schools, the ministerial association, farm equipment dealers and elevator operators, an air tour, pasture tours, appearances before civic groups, revision of the district program of work, investigation of watershed programs with a view to their applicability in the district.

The Michigan Soil Conservation Districts Law of 1937 provides for the establishment of a State Soil Conservation Committee. The function of the committee is to administer the State Districts Law. Its membership includes four practical farmers from among the directors of the 70 districts in the State. In 1949 Van Aken was appointed to serve as a member of the committee by the Governor. He was reap-

Mr. and Mrs. VanAken.

pointed to a second term of 4 years in 1953. In this capacity he has been involved with the organization of 15 new soil conservation districts. In most instances, he has at some stage assisted local people in the establishment of their districts.

The State Association of Soil Conservation Districts elected him president in 1950. He previously had served 2 years as vice president. He served as president until February this year, when he declined to run for reelection because of the pressure of other activities and a sincere belief that leadership should be changed occasionally. His counsel and active assistance to the state association will continue to be available in any way that it can be used to further the work of districts. During Herb's tenure as president the organization was instrumental in bringing about many worthwhile achievements. In 1952, the state association, after an analysis of needs for conservation research activities, carried their story to the Michigan legislature, which appropriated $30,000 to be used in research projects having to do with soil erosion and depletion as influenced by soil management in the fruit areas, in a study of rotations and cultural and tillage practices necessary for improvement of physical characteristics of Michigan soils, in an economic analysis of crop and livestock production practices associated with conservation farming, in an erosion and land use study, and in the establishment and maintenance of grass and legume combinations on the State's medium- and lighter-textured soils. This work is carried on by Michigan State College.

The State association has also been active in purchasing available supplies of nursery planting stock for resale to districts.

As president of the state association, Van Aken served as a delegate to the annual meeting of the National Association of Soil Conservation Districts. In 1953, he was elected a director of the national association, and this year was reelected.

For 6 years, he has served as the representative of the state association to the Michigan Agricultural Conference. This Conference is an organization of representatives of all active agricultural groups in the State banded together to promote the interests of the State's agriculture.

In June 1953, the Secretary of Agriculture appointed Herb as one of the three farmer members of the Michigan State Agriculture Stabilization and Conservation Committee, which administers the price support program, conservation cost-sharing, and acreage allotment in the 83 counties.

Herb has found time to be active, too, in a number of other organizations. At one time or another, he has been affiliated with such organizations as the Dairy Herd Improvement Association, the Artificial Breeders Association, the Eaton Council of Boy Scouts of America, the Eaton County 4-H Fair, has been a director of the Lansing Area Production Credit Administration office, a member of the Eaton County school board, an alternate member of the Eaton County Agriculture Stabilization and Conservation Committee, the County Agricultural Extension Advisory Council, the Michigan Farm Bureau, the Eaton County Agricultural Council, has been an associate member of the Soil Conservation Society of America, and belonged to Kiwanis, Masonic lodge, and Methodist church.

Last fall the Michigan United Conservation Clubs honored him at their annual meeting in

Cadillac. He was given an award of merit citing him for "outstanding service to the cause of conservation in the field of agriculture." It was the first such award ever made to a Michigan farmer. This was a fitting tribute from the State's 57,000 organized sportsmen who realize the contribution Herb has been making to the conservation of the State's soil and water resources, and consequently, to its game and timber resources.

In addition to all the above "extra curricular" activities, Herb does operate a farm. The Van Aken farm of 300 acres is, of course, operated under a complete soil and water conservation program. It includes pasture improvement, crop rotations effective in controlling erosion, fertility programs, and two farm ponds. One farm pond provides stock water at a pasture area removed from the main farm; it is stocked with bluegills and bass, and it also serves as a swimming pool for many children from the surrounding Eaton Rapids area. The main enterprises consist of dairying and raising 32,000 broilers per year. The broiler enterprise now is being expanded by the construction of a 260-foot poultry house which will have a capacity of 10,000 birds.

Credit for his being able to give so generously of his time to public service rests largely with Mrs. Van Aken and their three sons who carry on the farm work in his absence.

Few other directors of soil conservation districts have been able to contribute so much firsthand knowledge of agencies and groups in a position to assist in an effective soil and water conservation program. Herb Van Aken's affiliation with the extension advisory council, the county school board, and the county agricultural council has given him keen appreciation of how public educational groups can assist the district program and, perhaps even more important, how the district can assist such groups in their soil and water conservation educational programs. The assistance rendered his district by the Soil Conservation Service has given him a firsthand appreciation of the importance of sound techniques. Years of affiliation with the Eaton County Production and Marketing Administration Committee and its Agricultural Conservation Program, and more recently with the State Agriculture Stabilization and Conservation Committee, has given him valuable insight into the importance of government finance or cost-sharing. As a director of the Production Credit Administration, he has noted occasions where credit is of extreme importance in aiding a farmer to amortize various conservation practices.

Few are the conservationists in Michigan who are unfamiliar with Herb Van Aken's philosophy and achievements. All are impressed by his enthusiasm, his sincerity, and boundless energy. Many groups have called upon him for addresses. Wherever he goes, he impresses people with the urgency of the conservation job and with the need for cooperation in its doing.

—EARL FENTON

Pilot District Dramatized

"GRASS—The Elko Way" is the title of a color motion picture produced by the Northeast Elko (Nev.) Soil Conservation District and the Nevada Association of Soil Conservation Districts.

James Stewart, Hollywood actor and Elko County ranch owner, narrates the 16 mm. educational film which is 18 minutes in length. Filmed last summer in the two-million-acre district, the picture was completed in Hollywood.

The National Association of Soil Conservation Districts is making arrangements for the film to be shown in soil districts of all the public lands states of the West.

The film relates how the rancher-supervisors of the Northeast Elko District have gotten underway a district-wide program of grass reseeding, restoration and improvement.

Three years ago the Northeast Elko District was designated as the nation's "No. 1 pilot district" for the West, where conservation problems involve both public and private lands.

The district supervisors pioneered in getting landowners and state and federal agricultural and land management agencies to work on a common program for improvement of all the district's land, water, and wildlife resources.

The picture shows how the supervisors initiated the grass improvement program, the steps being taken on range and irrigated lands and the program's provisions for improved fishing, hunting and camping.

Cooperating with the district and the state association in the production of the film were the Nevada Cattlemen's Association, The Nevada State Soil Conservation Committee, The Nevada State Departments of Fish and Game and Agriculture, The Fish and Wildlife Service and the Bureau of Land Management of theU. S. Interior Department, and the Soil Conservation Service, Forest Service and Agricultural Conservation Program Service of the U. S. Department of Agriculture.

Graham Hollister, Genoa, Nev., rancher, was chairman of the Nevada Association's motion picture committee which arranged for the filming of the Northeast Elko Story. Eyer Boies, one of the Northeast Elko Supervisors, was chairman of the district's picture committee. Rancher-supervisors of the Elko District in addition to Boies are Harvey S. Hale, chairman, Clarence Elquist, John Moschetti, Vance Agee, and William Gibbs, Jr.

Conservation Partnership

By W. MARTIN MUTH

A UNIQUE system of working with farmers has been developed by the farm equipment dealers and the district directors in Pennsylvania's Lancaster County Soil Conservation District.

The conservation partnership began after the dealers heard a thorough explanation of the district and its program and saw some of the fine work the district was doing to help cooperating farmers solve their conservation problems. Meetings and field trips were jointly arranged for by Amos Funk, chairman of the board of district directors, and Ben Snavely, president of the county dealers association.

Note.—The author is work unit conservationist, Soil Conservation Service, Lancaster, Pa.

The dealers, realizing they too had a stake in the agricultural future of the county, expressed a desire to assist the district directors in promoting conservation work on the farms in the district. The directors accepted their offer.

All 47 county dealers decided the first thing they should do was to learn first-hand all they could about the conservation program and problems in the district so that they would have the background and understanding to really talk conservation. To accomplish this, the district directors selected a cooperator in each dealer service area who had a conservation plan fully or partially established on his farm. Each dealer was then assigned the responsibility of working with the cooperator in his particular area. Frequent visits to these cooperator's farms are giving the dealers an unusually intimate acquaintance with and knowledge of the conservation problems and their solution. In turn, the farmers are benefiting from regular chats with men who know machinery.

The next step of the Lancaster dealers in this cooperative venture is for each to enlist one new district cooperator during the coming year.

The contacts the dealers are making are resulting in more farmers having a better perspective of conservation and the benefits that can be obtained. They also feel that the contacts are creating good will among both their regular and their prospective customers.

One day not long ago five newspaper clippings came to my desk. The first told of a devastating dust storm in the Great Plains.

The second described a million dollars worth of flood damage incurred in a few hours by a small southwestern city.

The third noted an appropriation of a large sum of money for dredging the ship channel in one of our harbors.

The fourth was an editorial which speculated that New York City restaurant customers may *not* get a glass of water with meals unless they ask for it.

A fifth was a forecast of crop production for this coming year.

Our newspapers note such events and developments day by day. But seldom do our writers take time to relate items to one another or to their common denominators—soil and water, and the use and management of those two basic resources.

These events are news because what happens to soil and to water so directly and so drastically affects *people*.

—D. A. Williams, Administrator, Soil Conservation Service, in a talk before the Rivers and Harbors Congress, 1954.

Soil Erosion Control On Okinawa

By R. R. HINDE and ALBERT F. SANDER

ONE OF the most serious problems encountered on Okinawa, Ryukyu Islands, is that of controlling soil erosion. Extensive military construction during the past 4 years on airfield, cantonment, housing and highway areas has aggravated the problem of reducing erosion and subsequent soil losses. Removal of natural cover of trees, shrubs, and grasses during construction has accelerated these losses.

Embankments sodded to Okinawa shiba grass (*Zoysia ashisiri.*)

The effects on tropical soils, when denuded of their vegetative cover and exposed to frequent intensive rainstorms, have long been recognized. These effects or soil losses which occur in the form of landslides in mountainous terrain and on lands of lesser slope are of particular significance. Loss of fertility by leaching of soil nutrients from cultivated lands also occurs with sufficient rapidity that many fields are abandoned after minimum tenure owing to non-productibility. These eroded and sterile soils recover very slowly. Restoration of soil fertility, however, may be accomplished under proper soil management practices. Management practices include but are not limited to addition of organic matter in the form of vegetative mulches and composts, application of chemical fertilzers, liming, and plowing under of legume crops. These practices with various modifications are essential to effect reestablishment of a protective ground cover of grass.

Accepting the challenge of controlling erosion and realizing the need for sources of suitable plant materials, the Far East Air Forces agronomy staff initiated control plans early in 1950 which included the establishment of plant nurseries. One nursery was established at Kadena Air Force Base and two at Naha Air Force Base. One of the Naha nurseries was organized and placed under direct management and supervision of the United States Civil Administration of Ryukyu Islands. Centipede-

Main waterways riprapped in bottom of channels, upper slopes sodded and mulched.

grass was brought in from Florida and planted in the Kadena nursery in July of 1950.[1] Two species of Zoysia-grass, Korai-shiba (*Zoysia tenuifolia*) and No-shiba (*Z.-japonica*), were brought in from Japan during the same summer and also planted in the Kadena nursery along with local Okinawa grass selections.[2] These

Note.—The authors are agronomist, headquarters Far East Air Forces, Tokyo, Japan, and chief, ground section, headquarters, USAF, Washington, D. C., respectively.

[1], [2] Introduced by A. F. Sander.

Revegetation, drainage flumes, Stearley headquarters housing area, December 1953.

early plantings were followed by the introduction of other grasses which were also propagated vegetatively.

The Kadena nursery was expanded in 1952 to over 10 acres primarily devoted to the propagation of grasses which provided planting material for the establishment of cover on all types of grounds. These grasses consist of centipedegrass (*Eremochloa oplinroides*), Okinawa shibagrass (*Zoysia* species); Manila grass (*Z.-matrella*); Korai-shiba (*Z.-tenuifolia*) and bermudagrass (*Cynoden dactylon*).

The nurseries are utilized for the propagation of tree and shrub planting materials for dust and erosion control, in addition to that of grasses. Trees include Australian pine (*Casuarina equisetifolia*;) chinaberry (*Melia azedarach*); acacia (*Acacia confusa*); narra (*Pterocarpus indicus*); and banyan (*Ficus religiosa*). Shrubs that are used for erosion control include such plants as bamboo, mulberry, althea and creeping juniper (*Juniperus procumbens*).

Flowering shrubs also used for dust and erosion control, to reduce bleakness of island slopes and to furnish a source not otherwise available, include species of roses, azalea, oleander, saucerleaf (*Nothopanax cochleatum*), jasmine and hibiscus. Some novelties such as banana and papaya trees are also propagated.

Plants propagated in the nurseries, however, represent only a small percentage of the total classified plant life occurring on the island. There are over 2,475 plant species, of which 500 are cultivatable. Plant growth thrives profusely in its natural state under the tropical and temperate climatic conditions characteristic of the southern and northern portions, respectively, of the island. Typhoons which frequently visit the island cause serious damage to plant life and prevent maximum growth, although the island

has an average of 85 inches annual rainfall with temperatures averaging 72 degrees.

Mechanical controls also play an important role in the control of erosion on Okinawa. Installation of these controls precedes the planting of grasses, shrubs, and other materials. Diversion terraces with sodded or soil-cement outlets, and flumes constructed of rubble or asphalt paving are used to intercept and carry the runoff from higher elevations to lower levels. The runoff at the lower levels is discharged into grassed waterways and other drainage facilities. Some of the major drainageways are coral rock riprapped, with the riprap usually extending from the channel floor to a height of 3 to 4 feet up the sidewalls. The upper surface of the sidewalls and adjoining slopes are spot-sodded with cogongrass (*Imperata cylindrica koenigii*) or with other grasses of low growth habit, in rows spaced 12 to 18 inches perpendicularly to the slope.

Drainage structure along highway, Kadena air base, 1953.

Bermudagrass is used extensively for lining drainageways and for stabilization of embankments. Planting experience indicates that bermudagrass and other native Okinawa grasses, when planted on 2-foot centers, will completely cover the soil surface in less than a year. Centipedegrass has proved very successful for vegetative cover on airfields, specifically when used for runway and taxiway shoulder stabilization. Runoff from pavement surfaces provides ample irrigation for adequate grass growth. Grass mulches consisting of "Talahib" or "Gushichi" (*Saccharum spontaneum*) and "Susuki" (*Miscanthus sinensis*) are also placed on slope surfaces to aid in control of soil movement. The seeds contained in the mulch material usually provide growth which forms a dense cover in a relatively short period.

Natural revegetation of denuded island slopes is rapid, although adequate erosion control by natural "healing" is difficult because erosion occurs at a rate equal to or exceeding that of plant growth.

Discussing soil erosion control on Okinawa in comparison with experiences in the United States, I. E. Dunn, present nursery and conservation foreman at Kadena Air Force Base stated, "Soil erosion control problems in the Far East were similar to those in the States, except that rainfall in the Far East was more intense, causing a more rapid rate of runoff and soil losses." He, however, has found that soil erosion on Okinawa can be controlled by using a combination of both mechanical and vegetative controls. Effective controls are established, although most of the work is accomplished with hand labor in contrast to the machine operations of the States. Another factor in establishing grass cover on Okinawa is that practically all plantings are made vegetatively. Establishment of grass cover from seedings has not proved successful. Seedings of bermudagrass have produced some fair results but those consisting of fescue, redtop and orchardgrass have been complete failures, when used either alone or in

(*Continued on page 24*)

Approach zone sprigged, overseeded and mulched, 1953.

Wildlife suffers along with people, soil and crops.

Effect of Dust Storms on Wildlife

Waterfowl stuck to the pond as the wind tore the land into swirling clouds, piling it deep along the fence rows, sifting through the boards of dwellings and barns.

By **R. F. GREGG**
Editor, *Colorado Conservation*

DURING February and March of this year, seasonal winds and a second consecutive dry winter brought back memories of the thirties as clouds of dust again rose over southeastern Colorado. Landowners, professional conservationists and the press feared for the land itself; but another resource—wildlife—suffered enough to provide the most dramatic proof of the effect of land use practices on all renewable resources.

First word of dust damage to wildlife came from Preston Steele, district game warden for the Colorado Game and Fish Department at Springfield. Steele found 22 geese, 3 ducks, 2 quail, 2 cottontails and 1 pheasant dead in various fields, apparently victims of dust. The nostrils and windpipes of all were choked with mud. Shortly thereafter word was received from Game Warden Hugh Gamble at Flagler of the death of 4 antelope, and from Wildlife Technician Robert Hoover of the death of 1 mule deer.

The worst tragedy was discovered a few miles east of Lamar, on the cracked, silt-filled flat of what had been a shallow range pond a few inches deep. Apparently seeking sanctuary from the dust, approximately 300 geese and a dozen ducks alighted on the water. Rapidly filling with airborne silt, the pond became a mudhole, and the waterfowl perished.

As this information came to light, the Department sent a questionnaire to all field personnel on the eastern slope of the mountains asking for a tabulation of wildlife losses. Surprisingly, no significant further losses were reported, although the consensus indicated that many small birds died.

The direct damage to wildlife is only part of the story, of course. In the most seriously affected drought areas, what little wildlife habitat existed (mostly along fence rows and ditches) is covered, since the vegetation caught the dust and piled it into drifts. It is reasonable to expect that resident game birds and small game animals will be seriously endangered next winter, and severe storms will probably bring large losses.

Another indirect effect will be loss of food if the drought continues through another year. In many areas, farmers expected to beat the threat of drought by stubble-fallowing alternating strips of land. But in the second year of the drought, there was not enough moisture in the plowed lands to start a crop, and the stubble was plowed, leaving entire tracts bare.

Among the casualties from dust.

If crop failures are widespread in these areas again this year (rains in early May helped the outlook somewhat) the wildlife food shortage next winter may be acute.

Tragic as the loss of wildlife is, and bleak as the future outlook is, the death of the game animals and birds may serve a useful purpose. People who cannot be aroused to the importance of soil conservation sympathize intensely with the problems of wildlife, and through publicity in *Life Magazine* and elsewhere (including our department's magazine, *Colorado Conservation*), these people may begin to see that unwise land use damages more than the landowner involved.

All the renewable resources are indeed closely interrelated, as ecologists have been preaching for years. And if the lesson is brought home by Colorado wildlife's experiences, the sacrifice may be worthwhile.

TEACHING THE BLIND

(Continued from page 15)

Of great help would be a brief text in Braille covering the subject matter of the course, relating specifically to the requirements of the Merit Badge Manual. Such a text would enable them to do some studying between lessons and reduce the time spent in reviewing. We would urge that this be done by anyone undertaking a similar project. It is also felt that some of the "Do" items listed in the manual can be performed by these boys under proper planning and supervision.

REVIEWS

RURAL SOCIAL SYSTEMS AND ADULT EDUCATION. By Dr. Charles P. Loomis and Others. 392 pp. 1953. E. Lansing, Michigan: Michigan State Press, $5.

This book represents an extensive inquiry to determine how effective our current organizations and social systems are in reaching and educating adults living in rural areas.

Among the organizations studied were the cooperative extension service, farm organizations, civic and service clubs, government bureaus, libraries, churches, newspapers, farm magazines, and colleges and universities. Also included were the families, friendship groups, and other informal groups.

The trend in rural America is toward formal organizations and away from those informal groups which so long have characterized it. These cultural changes are significant. This book will be of interest to anyone dealing with rural social systems and adult education.

—T. A. NEUBAUER

OKINAWA

(*Continued from page 21*)

mixture. Italian ryegrass also has produced fair results when used for over-seeding of sprigged plantings of bermudagrass and Zoysia.

Present erosion control activities indicate the importance of such programs to the future of the island but well planned grounds-maintenance and timely soil-management practices are required if the soil is to remain under control.

"The same vegetative practices and structural devices which hold water on the land for use there also serve to slow down its flow in the creeks and rivers, and thereby to reduce soil erosion, flooding and siltation. Hence the basic plan of small-watershed protection involves the use of conservation practices on the farmlands, pastures and woodlands, supplemented by waterflow-retarding structures and other water control measures on the small streams."

—E. A. NORTON, in a talk at Resource Conservation Field Day, Tulsa, Okla., May 8, 1954.

DISTRICT SPREADS STORY.—"Our work pays off in the support of businessmen," says Scott Rairdon, the alert chairman of the Elk County (Kans.) Soil Conservation District.

Here, in the Bluestem Hills section of Kansas, Main Street teams with Farm Lane to do a remarkable job of selling conservation. Businessmen know the district program nearly as well as they do the products on their own shelves. Their enthusiam shows in many ways, one of which is the donation of prizes for the annual Elk County Soil Judging Contest.

In 1946 the situation was different. Soil conservation was less well understood and appreciated than it is today and local businessmen were reluctant to help the program. That was before the board started its acquaintance campaign.

Now after 6 years of work, nearly 400 cooperators, or almost half of the county's active farmers, are helping themselves to build better farms through the district's program.

One reason for the rapid progress has been the district board's continuous good will and informational program.

The board has received whole-hearted support in all its undertakings from John Maxwell, the county agent. This big, hard-working redhead pushes soil improvement as his number one project.

Last winter the board sponsored the filming of a color motion picture showing steps in the development of a complete conservation plan. Taken on the farm of a banker award winner, the film was shown to most of the organized county groups.

This was followed by the district's own newspaper. The county does not have any daily newspapers or regular reporting service, so the board hired a printing firm to produce a full size, six-page newspaper to let everyone know the district's activities through the preceding year.

Supervisors, working in teams, contacted business firms for their support of the paper and in one afternoon sold more than enough advertising to pay its cost. All merchants contacted were glad to get in on the project.

The paper was edited by board members, the county agent, and Soil Conservation Service personnel. The paper contained pictures, feature stories, a record of the board's work, and it stressed the annual meeting.

Twenty-five hundred copies were distributed to every county box holder.

This summer the supervisors, to show their appreciation for the courtesies the townfolk had given the district program arranged, with the help of Maxwell, a businessman's twilight tour on a cooperator's farm whose plan was complete and where results could be plainly seen.

Two such tours were held, one in the north and one in the south part so that all might attend.

The townsmen received letters of invitation telling them district cooperator friends would call after work to take them to the farm where the tour would be held.

The host farmer welcomed the group. SCS personnel used drawings and pictures to tell what had been done on the farm and what would be seen on the tour.

Tractor-drawn trailer wagons carried the visitors over the farm for a look at grassed waterways, pasture seeding, legumes, terraces, and other conservation practices.

A remark at one of the stops that impressed many persons was made by Floyd Sweet, a contractor: "When I was terracing this field it was riddled with gullies and I never expected to see such crops as these."

In the cool twilight, with a soft breeze waving heavy heads of wheat and lush brome, the guests were in a mood to see and appreciate the community-wide benefits of conservation planning.

Willard Morss, president of the First National Bank in Howard, commented, "I have been to hundreds of meetings but for learning a lot and still having a fine time you can't beat these twilight tours."

A cafeteria supper, served by the supervisors, completed the evening. More than 80 percent of the businessmen of the county participated in one of the two tours.

The board of supervisors are glad to have a part in raising the county's agricultural standards. As Scott Rairdon says, "The more active we are, the more we enjoy our work and the more company we have in our efforts."

—D. D. HOLLAND

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

Soil Conservation is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, under approval (August 6, 1951) of the Director of the Budget. Soil Conservation supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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TREES FOR BOYS.—C. J. Ray, Sr., a supervisor of the Edisto (S. C.) Soil Conservation District, has a unique form of investment for each of his four sons. Shortly before Clifford, Jr., was born 14 years ago, Ray planted 5 acres of pine seedlings for the expected heir. These trees are now large enough to thin.

As the other three boys—Steed, 11; Bradford, 9; and Jonathan, 3—have come along this far-seeing father has done the same for each of them.

Ray's tree planting has not been restricted to the plots for the boys. He tries to plant 3 to 5 thousand seedlings each year in carrying out his district farm plan. Some of these are planted in the less productive fields and others in existing woodland where the stand is thin.

A USEFUL TEACHING AID.—The soil conservation district of New Castle County has again given a year's subscription to Soil Conservation Magazine to all FFA Chapters in New Castle County, Delaware. The FFA teachers state that the magazine is widely read and they are most grateful to the district supervisors for this gift.

FRONT COVER.—A bit of agricultural Minnesota from the air. The stripcropping and contouring are on the Nelson farm a mile west of La Crescent. We are indebted to William H. Lathrop for the exceptional photograph.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Etter, the Bowens, and the seed drill used to reseed old cultivated land on ranch.

More Grass—Less Dust

This rancher—cited for his conservation achievements—weathers severe droughts because he pins down his land.

By VIRGIL S. BECK

"Every acre of cultivated land in Kiowa County will have to be put back to grass if soil blowing is to be stopped," declares L. C. Bowen, who operates a 20-section ranch of 12,800 acres about 22 miles northeast of Eads, Colo.

KIOWA County is in Colorado, in the critical area where severe dust storms originated last winter and spring. Of the 1,146,000 acres in the county, 605,000 acres of cultivated land and 62,000 acres of rangeland have been blowing this year.

Since the Dust Bowl period of the thirties a vast amount of acreage, much of which is unsuited for cultivation, has been plowed for wheat production. In 1942, only 4,939 acres were planted to wheat, while 225,000 acres were seeded in 1953. Some of this land has become a serious wind erosion hazard during the last 4 years of drought.

When Bowen moved to Colorado from Perryton, Tex., in 1948, and bought the ranch, he found that one 640-acre section and two 90-acre fields had been in cultivation and were in condition to blow. The 640 acres had been broken

Some of the herd of 400 Herefords on native grass pasture. In 1952 Bowen cut 100 tons of hay from 180 acres of pasture; 90 tons in 1953—notwithstanding drought. He still has hay left from last year's crop.

out in the thirties and abandoned after being planted to corn for 2 years. The field had been blown out down to the hardpan, and more soil blew with each high wind.

"I'm a rancher and these three old fields were a constant menace to my grassland, so I decided to try to get them tied down as soon as possible," Bowen recalls. He became a cooperator of the Cheyenne Soil Conservation District in 1950, and received assistance from Soil Conservation Service technicians in establishing a soil and water conservation program on his ranch.

In 1950, Bowen planted black amber cane on the 640 acres and Sudan grass on the two 90-acre fields in order to get a stubble. He then drilled sand lovegrass in the stubble and got a fair stand. Despite the series of dry years, the grass is improving on the old fields. The 640 acres are not being grazed. The two 90-acre fields are furnishing grazing and seed. Where the sand lovegrass stand has been thin, Bowen has seeded a mixture of switch, side-oats grama, sand lovegrass, bluestem grass and yellow clover, using his own seed drill.

Bowen, who is assisted on the ranch by his son, Buster, has a herd of around 400 Herefords, some of which are purebred. Despite the 4 years of drought, Bowen has not had to reduce his herd.

"The range grasses have been short, but we have managed to get by," he says. He attributes his success to his soil and water conservation program. In addition to revegetating the old cultivated fields, Bowen rotates grazing and has located watering places to get an even distribution of grazing. He saves the pastures nearest the farmstead for winter grazing.

Bowen has two meadows of about 180 acres along the Big Sandy and Rush Creeks. These provide excellent grazing and are the source of his hay crop. He cut 100 tons of hay in 1952, 90 tons in 1953, and will have some left over this year. Hay averages half a ton per acre.

Bowen feeds cottonseed cake in the winter, and creep feeds his calves. For the last 2 years his calf crop has been better than 90 percent. The calves are marketed at 400 pounds or more.

In recognition of his outstanding conservation work, Bowen was honored by an award in the *Denver Post*-KLZ Soil Conservation Contest in 1952, the citation reading: "In recognition of outstanding accomplishments in the field of soil conservation."

(Continued on page 35)

Grass on native pasture examined by L. C. Bowen, rancher; Fred O. Case, technician; Buster Bowen.

The Salt Creek Tree Plantings

Pines and hardwoods behave very differently on good and poor soils, and under stress of various pressures.

By J. A. GIBBS

Conditions on gullied area after 5 growing seasons.

INCLUDED in the various land use practices in the old Salt Creek Watershed project, Ohio, was the planting of many hundreds of thousands of trees on eroded land. In 1935 alone, about 1,800,000 trees were set out.

At the outset of this ambitious program, the most popular species for planting was the black locust, chiefly because it could be produced and made available in large numbers in a relatively short time. The percentage of pine, however, was increased as rapidly as the stock could be produced, for it became apparent very early that pine would survive and thrive on a much wider range of soil and site conditions than black locust and various other hardwoods.

Most of the sites were eroded fields. Their soils came from limestone and shale parent materials, with the latter predominating. One of the most typical soils was Muskingum silt loam. Black locust and other hardwoods, including black walnut, tulip poplar, and white ash, were planted on better soils such as Belmont, Brooks, and West Moreland. Some planting was done on spoil banks, more or less for observational purposes.

Generally speaking, no special methods of site preparation were applied. Scalping and planting with a grub hoe, using the center or side-hole method, were more or less standard. There was no planting by machine.

Most of the hardwood stock consisted of 1-year seedlings; pines were transplants. Hardwoods, particularly black walnut, were grown from stratified seed. Red, white, and Scotch pine were propagated in both pure and mixed plantings. A few cuttings of cottonwood and

Note.—The author, now retired, was formerly forester with the Soil Conservation Service.

Gullied area set to locust trees and fenced out of pasture in early days of demonstration.

willow were used back of check dams.

Most of the planting was in the spring. Severe heaving of the trees out of the ground sometimes followed fall planting, particularly when black locust was planted on bare soil.

Standard spacing was 6 x 6 feet in fields; in gullies, as close as 3 feet apart.

Periodic observations have been made of typical plantings, and in the summer of 1952 a detailed study was made of selected plantings representing the more commonly encountered conditions. This latest study includes the measurement of growth of the various species planted. A summary of this information follows:

1. *Survival.*—In general, the pines show very good survival even on the more severely eroded and dry sites. Of them all, white pine makes the poorest showing. This results in poor density in most of the planting of this species. More or less regardless of varying site conditions, there are many small dead trees scattered about. The survival of black locust and hardwoods has been more erratic. On many of the poorer hardwood sites the mortality has been very heavy. However, some good stands, particularly of black locust, tulip poplar, black walnut, and white ash, have resulted on the better sites. It has been a rather common observation over the years that on severely eroded sites where pine and hardwoods were planted side by side the pines have done well in sharp contrast to the failure of the hardwoods. It has also been observed in several places that black locust did well during the first few years, but rather suddenly started to die in large numbers. The black locust borer undoubtedly was partly to blame. A good example of this was on some of the spoil banks north of Zanesville where black locust flourished the first 6 to 8 years and then started to die and break over in large numbers. On these same spoil banks there is an interesting comparison of the success of pine and hardwoods. On two adjacent plots with comparable conditions, planted cottonwood and willow failed almost completely, while Scotch, red and Austrian pine survived and grew very well.

Same area two and a half years later.

2. *Rate of growth.*—Below are listed measurements of diameter and height growth of all species planted. Volume growth is also shown for some plantings.

Average Growth of Typical Plantings, per Year, by Species

Species	Diameter (Inches)	Height (Feet)	Volume per Acre Cords	Posts
Red pine	.25 (3)	1.4 (3)	.61 (2)	
Scotch pine	.27 (3)	1.9 (3)	.96 (2)	
White pine	.23 (3)	1.8 (3)	.47 (1)	
Tulip poplar	.24 (2)	1.9 (2)	.61 (1)	
White ash	.26 (1)	2.0 (1)		
Black walnut	.20 (1)	1.5 (1)		
Black locust	.24 (2)			50 (2)

Note.—These plantings were 18 years old when measured, except for one white pine which was 17 years old. Cords go to a 3″ top diameter. Figures in parenthesis indicate number of plantings measured.

The table discloses that Scotch pine has excelled in rate of diameter growth and is equalled in height growth only by white ash and tulip poplar. In observing current height growth it was commonly noted that white pine has accelerated its annual rate of gain more than any of the other species during recent years. In studying these figures, it should be borne in mind that the pine plantings represented are more or less typical of many similar plantings in the watershed that were planted at the same time, while the hardwood plantings are more

or less the exceptions. In other words the pine plantings were generally very successful, while only a few of the hardwoods that were put on the better sites were successful.

Some interesting comparisons of the growth of planted hardwoods in mixtures have been found. For instance, on one farm tulip poplar and white ash were planted in alternate rows, spaced 6 x 6 feet, on what proved to be a moderately good site for hardwoods. Periodic observations disclosed that the tulip poplar gradually overtopped the white ash. On a plot of one-tenth acre there are 48 live tulip poplars averaging 40 feet tall and 5 inches in diameter, but only 36 white ash, the latter averaging only 1.5 inches in diameter, most of which are overtopped and suppressed by the tulip poplar. The maximum diameter of tulip poplar was 9.4 inches; that of white ash, 3.9 inches.

Periodic observations of a mixed planting of white pine and tulip poplar discloses some interesting trends in the growth of the two species as reflected by the varying site conditions. In a ravine the tulip poplar shows pretty

Immediately after red pine seedlings were planted on badly eroded hillside. The soil is Muskingum.

good vigor from the start, while on the ridges where erosion was worse, they show very poor growth over several years and still reflect the poor site conditions. The white pine on the other hand, has done uniformly well all over the area. Measurements, however, reveal average diameter and height of the two species as about the same today.

In one four-way mixture of pine—Scotch, red, white and Austrian—the Scotch has dominated from the start. In fact the Scotch pine has been so aggressive that all of the red pine

As pines matured a nice ground cover was established beneath them.

and most of the white pine within the plantation have been overtopped. The site in this case was badly eroded Muskingum loam.

As indicated previously, the result of the black locust planting has been most variable. In so many areas the trees did well for a while and then suddenly suffered deterioration and death. On the other hand, in a few plantings some excellent results have been seen—fine, tall, clean trees. In one planting, for example, the trees averaged about 5 inches in diameter and some would yield as many as six posts.

The spoil bank plantings mentioned above have been of special interest. Of all its contemporary plantings—red, scotch, and Austrian pine, black locust, cottonwood, willow, and black walnut—the black locust got off to the

After 12 growing seasons, the pines were 20 feet tall.

most vigorous start. In fact, in a very few years it had completely covered the banks, while the pines were gradually taking hold. Today the pines, in turn, have established very good cover on the banks and are found in full stands. The cottonwood and willow failed completely, and the walnut, which was planted in the choicer spots, has done but moderately well.

Both stratified nuts and 1-year old seedlings were used in planting black walnut. The nuts have produced the better results. Some very fine young stands of black walnut have been established by planting stratified nuts early in the spring, which shortens time during which the nuts are likely to be preyed upon by rodents.

3. *Natural invasion.*—Invasion of tree plantings in the Salt Creek watershed by quite a variety of woody species began to occur surprisingly early, considering the poor and eroded sites. As early as 1939 the records list red and white oak seedlings, black cherry, sassafras, sycamore, elm, red maple, hickory, dogwood, and tulip poplar. More recent records list, in addition to these, black walnut, black gum, honey locust, sumac, white ash, ailanthus, and redbud. One black locust planting studied in 1952 has almost a complete understory of American elm, ailanthus, and aspen.

4. *Accumulation of ground cover.*—The pines have developed a much heavier ground cover than the hardwoods. They have also developed the best young timber stands, due to better, more uniform survival. Some quite remarkable examples of this have been observed on some of the poorest, driest sites. For example, on a narrow break of shaley, washed-away land near Zanesville, red pine seedlings were planted in April 1935. Surprisingly good survival resulted, but quite slow growth at first. Within 8 years however, this bare site was completely covered with a fine stand of pine trees and a ground layer of pineneedle litter.

5. *Damage by fire, insects, and grazing.*—During the periodic visits to the Salt Creek watershed damage to plantings by grazing frequently was observed by me. As fences deteriorated, both sheep and cattle gained entrance and caused very noticeable damage to trees and to soil. Damage by fire was not common. About the only insect damage noted was among the black locusts where the borer appeared within a few years after planting and did more and more damage as the years passed.

Summary

The performance of these Salt Creek watershed plantings offers experience useful in connection with future tree plantings.

1. Pines have shown much more tolerance of poor site conditions than hardwoods. On eroded soils, pines should be used for reforestation and erosion control—preferably red and white pine. Even though Scotch pine has grown faster than red and white thus far on this watershed, it does not produce nearly so good quality forest products as the red and white. However, it does produce very desirable Christmas greens. Therefore, it could be mixed with the others to be taken out in 6 to 7 years for this use.

2. Black locust and other hardwoods belong only on sites with little or no erosion.

3. On spoil banks in the watershed, red, Scotch, and Austrian pines can apparently be planted with a good chance of success over the years. Black locust and other hardwoods have not done well on these Salt Creek plantings.

4. On small areas of good, well-drained soil that cannot be efficiently used for crop or pasture the planting of such species as tulip, white ash, and black walnut (preferably in pure blocks) is suggested. On these good sites very rapid growth of tulip poplar, in particular, can be expected.

5. Mixtures of white and red pine are proposed. Mixtures of pines and hardwoods can apparently be made with a reasonable degree of success, provided the soil is not too poor for the hardwoods. A preferable procedure would be to plant the hardwoods on the better spots, such as along ravine bottoms.

6. In planting black walnut, use stratified seed. Plant several nuts per spot in early spring.

7. To avoid danger of winter heaving, plant trees during early spring. This is particularly advisable where bare sites are being planted.

8. To protect plantings from grazing damage, the rule should be to exclude livestock at all times. Planting of black locust on favorable sites will help prevent excessive damage by the black locust borer. Where planted areas have high fire hazards along boundaries it may be necessary to establish and maintain firebreaks.

Conservation In Yet-Young Land

Native forest range

Modern farm planning and management make abandoned homesteads productive and profitable.

By
FLOYD W. HOUGLAND

Joe Somday.

JOE SOMDAY is an Indian living in the Curlew (Wash.) Soil Conservation District. He recalls hiding, as a boy, with his mother behind a tree to watch the first white man come to the valley. This footnote to history speaks for the newness of agriculture in Ferry County.

Many years after this incident, in 1883, General Sherman entered the valley and noted its thick grass, fine timber, and beautiful scenery. But it was not until the early part of this century that settlement began in earnest. Discovery of gold in the late nineties and shortly thereafter the opening of the area to homesteading started an influx of white families.

Note.—The author is work unit conservationist, Soil Conservation Service, Republic, Wash.

As compared with other parts of the country the area's period of exploitation was short and not particularly severe. Many of the early settlers believed a timber shortage was imminent and took up homesteads in an effort to profit from it. Logging methods were such that many areas accessible today for logging were not at that time. The Colville National Forest which covers a large part of the Curlew Soil Conservation District was established in 1907. Today, conservation thinking is prevalent. Comparatively speaking, we didn't have a chance to "wear out" any farms. Even so, problems arose and mistakes were made. Wild horses by the hundreds depleted large ranges on private and forest lands alike. Many a homesteader put his plow to land better suited to grass and timber. At best, the homestead size operation furnished only a meager living. One by one, these units were abandoned and in their wake remained many acres of non-producing land—land which once provided livestock and forest products and watershed protection.

Here, where the raising of beef is the main pursuit, it was realized that the abandoned

homestead would have to be made to produce. Most operating units were stocked to capacity; the balance was fine between ground needed for hay and that required for range. Any practice requiring the withholding of a field, even temporarily, would reduce the capacity of the unit for the time.

The story of how A. H. "Dutch" Bremner, the 1953 Washington State Cattleman of the Year, overcame these problems is representative of the inspiring experiences of farmers who are working through the Curlew Soil Conservation District.

Bremner's ranch contains several former homesteads which were weighted down with all the customary problems. The district was asked to assist in developing an overall plan for the ranch. It took a little while for the technicians to cover the 6,000 acres. On the maps were indicated the areas to be seeded, the placement of drift fences, the water to be developed, the land to be cleared, the location of irrigation systems, the tentative grazing dates, and many other items. All of the measures to be taken were listed on a couple of sheets of paper. Dutch then set down tentative dates for completion of each part of the job.

The program is well under way. The first achievement was a threefold increase of hay production on existing cropland. This was realized through irrigation, drainage, fertilization, the use of improved varieties, and better seedbeds. Clearing brought in additional land for hay. This permitted the seeding to pasture of fields no longer needed for hay. Drift fences, water developments, brush eradication, and a close check on rotation and deferred grazing, along with the range-seeding program, are keeping the increase in range apace with that in hay.

Tony Evanko, Forest Service range conservationist, reports how this farmer selected grass species for range seeding:

"Adaptation studies of forage species conducted by the Northern Rocky Mountain Forest and Range Experiment Station of the U. S. Forest Service, in cooperation with R. H. Martin, local rancher, provided the basic information—planting season and performance of adaptable species. Four outstanding species were selected

Crested wheatgrass and intermediate wheatgrass planted in spring of 1952 on marginal cropland formerly producing one-half ton of rye hay per acre. (Photo: U. S. Forest Service, June 1953.)

and spring-planted in well-prepared seedbeds in 6-acre pastures. These plantings, in addition to revegetating such lands, are to be used in controlled grazing trials to determine the effect of the reseeded grasses on early spring gains of cows and calves and the response of these grasses to grazing treatment. A nearby unseeded area is to be used as a comparison. Although the plantings were very successful, two growing seasons have been allowed to permit the plants to become well established before beginning the grazing trials. Herbage production of the reseeded stands has not been determined, but it is readily apparent that it will be many times greater than on the adjacent check area. Although not established for seed pro-

Comparable adjacent unseeded area supporting a sparse cover of inferior annual weed species of little or no grazing value. Camera case 8 inches high. (Photo: U. S. Forest Service, June 1953.)

duction, 535 pounds of grass seed (currently valued at $411) were harvested from 3 of the pastures—an average return of about $25 per acre from land considered essentially non-productive. The seed will be used to plant an additional acreage. Under his rehabilitation program, 50 acres of former cropland are to be reseeded annually."

Simultaneously with land improvement, Dutch Bremner is determined to raise better cattle and more cattle. Assisted by the Extension Service, he has procured better bulls, started selective breeding, and rearranged yards and corrals to handle the stock better. His selection as 1953 Washington State Cattleman of the Year is well deserved.

MORE GRASS—LESS DUST

(Continued from page 28)

Despite his best conservation efforts, about 1,500 acres of Bowen's native grassland have been damaged this year by soil blown from nearby cultivated fields.

"About 30 percent of the wheat farms in this area are owned by non-residents," says Bowen. "When blowing starts, they are not here to do anything to stop it, so we have to eat their dirt. Furthermore some of the resident farmers move out and leave their problem with us when their land starts blowing. If this soil blowing isn't stopped, a lot of our good grassland is going to be ruined. That's why I say it all should be put back to grass, for this is a ranching country."

For protection against the blowing dust, Bowen has established a tree windbreak around his home, and this spring he planted trees around his barnyard.

TEACHER'S INSTITUTE FEATURES CONSERVATION.—A conservation workshop, in which a number of South Dakota soil conservationists and specialists took part, was a feature of the annual Campbell County Teacher's Institute held at Herreid, S. Dak., last fall. Approximately 45 teachers and the members of the Herreid high school senior class attended.

The program, first of its kind ever held in South Dakota, was based on the new textbook, "Conservation of South Dakota's Natural Resources" which covers five main categories of conservation—soil, water, plants, wildlife and minerals. The textbook was developed at a Northern State Teachers College workshop held at Aberdeen, S. Dak., and is currently being made available to every school in the State.

A special feature of the program was a talk by Dr. Warren C. Lovinger, president of Northern State Teachers college, on "Natural Resources and Human Resources."

A. Forrest Sorensen, area soil conservationist of Mobridge, presented a general review of workshop objectives. This was followed by discussion on soil, water and plant conservation by John T. Dunlavy, soil scientist, Arthur R. Fenn, area engineer, and Leslie Albee, range specialist. Reuel Janson, state game biologist spoke on wildlife conservation and Elroy Lume, soils survey supervisor, discussed minerals. A summary by State Conservationist Ross D. Davies of Huron concluded the program.

Calvin Ochsner, Campbell County soil conservation district chairman, presided at the morning session, and Ervin Grenz, vice chairman, at the afternoon session. Michael Madden, extension agent of Campbell County, was master of ceremonies at the noon luncheon.

CONSERVATION of human and natural resources is an opportunity and a challenge. Many schools recognize this opportunity and are doing something about it. A school in South Carolina has set an example in this respect.

The teachers at Newberry Junior High School have been relating the conservation of soil, water, wildlife, minerals, and forest resources to subjects taught during recent years. They participated in many classroom activities during the 1953-54 school year. They brought their year's programs of emphasis in this field to a close on May 28 by taking all the children and teachers in Newberry Junior High School on a tour to see soil and water conservation on some farms near Newberry. There were 263 children and 6 teachers on this tour.

The tour was arranged at the request of R. E. Beck, principal. The group left the school at 9:15 in the morning on the last day of school. and returned at 11:00. Even though it was the last day of school the children showed much interest, and their conduct and attention were exceptionally good.

They visited the farm of T. O. Stewart, where a whole farm soil and water conservation plan, prepared by him with the assistance of Soil Conservation Service technicians, has been applied.

They also visited Rookwoods, the summer home of Mr. and Mrs. Don Rook of Newberry.

Note.—The author is area conservationist, Soil Conservation Service, Chester, S. C.

Newberry teachers on tour: Standing—Mrs. A. H. Counts, a newspaper correspondent; Mrs. Naomi Epting, Mrs. W. L. Welborn, Mrs. Clifton Graham, and Mrs. Tom P. Johnson; kneeling—E. E. Epting, SCS technician, and W. A. Ridgeway, assistant county agent.

High point in year's study of soil and water conservat
of Newberr

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Natural resources bec
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T. O. Stewart Farm by 263 children and 6 teachers School.

Visits A Farm

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Mr. and Mrs. Rook have conserved nature in a remarkable way in the form of virgin forests, virgin soil, rock formations, native vegetation, and other forms of natural wildlife. The visit to Rookwoods was so the children could capture in their experiences an appreciation of vital resources in their natural protected state. There is a beautiful farm pond at each of the places visited. There are also bicolor plantings for wildlife.

The teachers in this school have done an exceptionally fine job of teaching conservation of natural resources in the classrooms and on the school grounds.

On May 13, Dr. Wilhelmina Hill, United States Office of Education, George W. Hopkins and Minnie Lee Rowland of the State Department of Education, visited Newberry Junior High School to observe their methods of relating resource conservation to subjects taught.

Teachers in all of Newberry County are in dead earnest about relating natural resource conservation to their curriculum. Recently, D. A. Bedenbaugh, of Prosperity, S. C., a supervisor of the Newberry Soil Conservation District, asked P. K. Harmon, director of the Newberry County Public Schools, to serve as chairman of a committee to plan ways to relate the conservation of natural resources to subjects taught. Harmon appointed other members to this committee as follows: S. P. Harris, teacher of agriculture, Bush River High School; R. C. Neal, member of the County Board of Education; J. V. Kneece, superintendent of the Newberry High School; H. M. Bedenbaugh, teacher of agriculture, Pomaria and Little Mountain schools; J. G. Long, superintendent of Silverstreet High School; R. C. Lake, superintendent of Whitmire School; Mrs. Ray Nobles, science teacher, Newberry High School; and Mrs. Naomi Epting, sixth grade geography teacher, Newberry Junior High School.

This committee met on May 11 in the Newberry County Office Building and also visited Mrs. Epting's classroom to see an exhibit of the conservation work done by her children during the year.

Harmon asked certain teachers to prepare recommendations as follows: J. V. Kneece for high school level; Mrs. Naomi Epting for ele-

(Continued on page 45)

The happiness of achievement shows on faces of Ronnie Davis, Dennis Durham, Brenda Hallum, Norma Lanelle, Karen Beardsley, and Gordon Page.

Parents, Teachers and District Join Forces

By ELSTON S. LEONARD

THE Pulaski County (Ark.) Special School District, the Lonoke-Pulaski Soil Conservation District, and the Parent-Teacher Association have worked closely together the past 5 years to speed up the job of conserving the soil.

"Gifts from the forest" is theme for this display of classroom material correlated with English, science, art, and conservation.

John F. France, principal of Roland school, with fifth and sixth grade boys who are learning the importance of soil conservation to their community.

The supervisors, who govern the soil conser-

Note.—The author is work unit conservationist, Pulaski, County, Ark.

vation district very much as a school board governs a school district, provide cash awards and a considerable amount of soil conservation literature and also encourage visits from soil conservation technicians, as their part of the project.

School officials and teachers do research, organize teaching material, and correlate soil and water conservation with the basic subjects of the classroom.

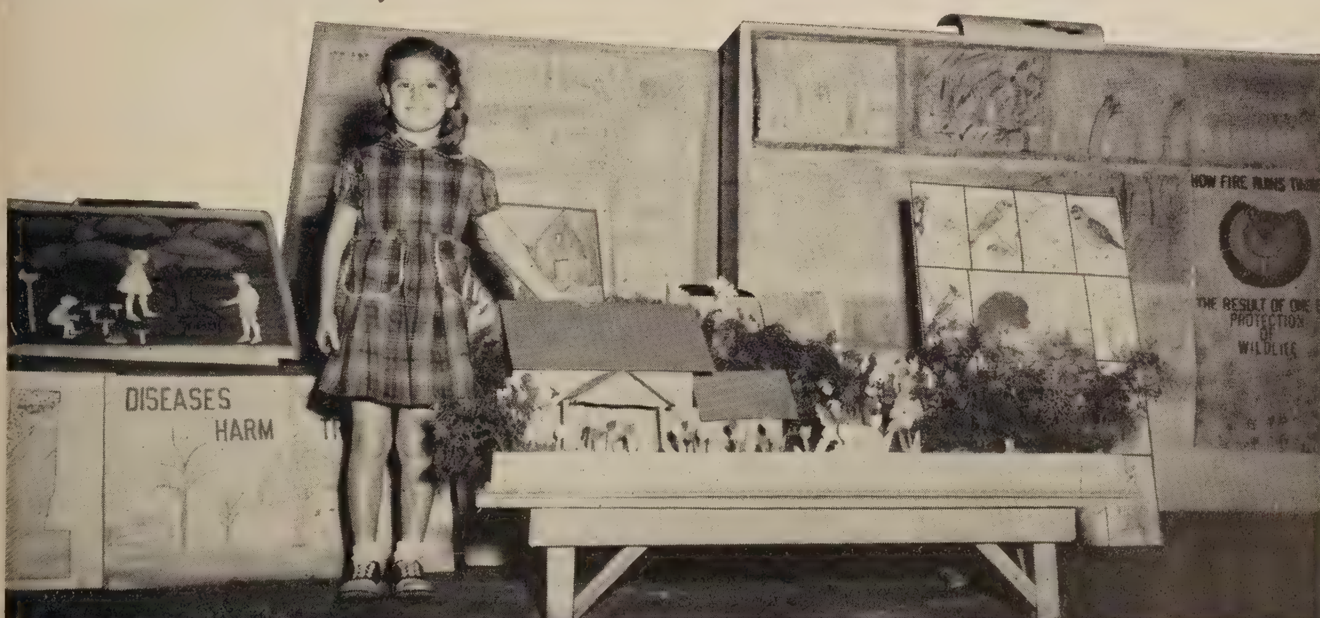
Tabletop model on wildlife, constructed after classroom study. It includes a stockpond with water, live turtle and minnows, many clay-modeled people, animals, trees, and grass. Labels added interest. Pupils: Mike Kirk, Connie Fleming, Judy Holland, Jackie Skinner, and Felix Stacy.

Salt and flour maps of soils in Arkansas, constructed after classroom work by sixth graders.

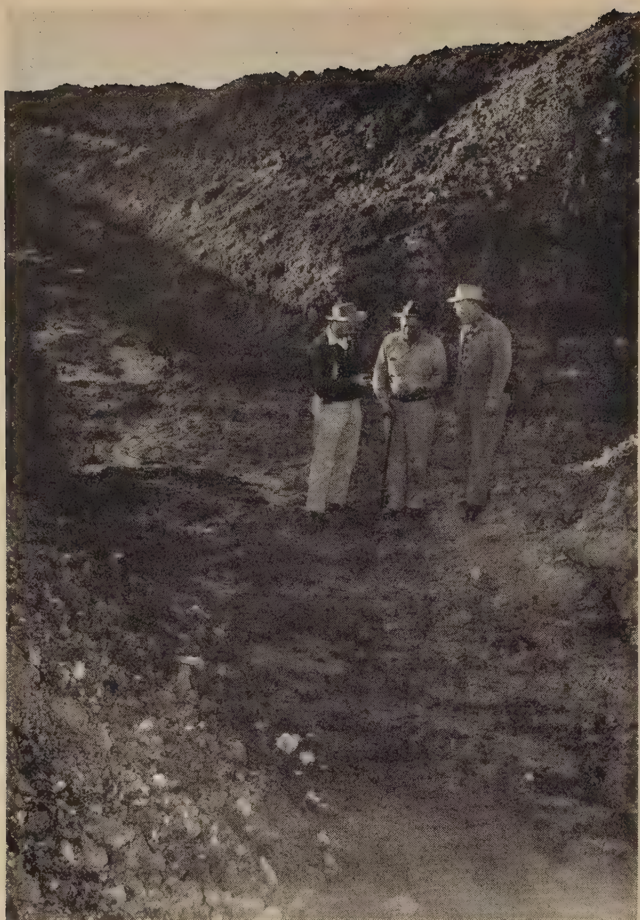
The Parent-Teacher Association assists by conducting conservation meetings, by providing funds to purchase teaching material, by judging exhibits, and by emphasizing the need for conservation instruction in their schools.

Soil Conservation Service employees working with the district assist by providing technical information for teaching units. They also appear before classes to talk on soil and water conservation, assist with field tours, help judge

(Continued on page 45)



Classroom study results in freehand drawings, resource maps and tabletop models, as well as future conservationists.



Inspecting main drain are SCS Engineer Bob Miller, and District Directors W. E. Rayn and Charles McGimsey.

yet 2 years old—has finished the job it set out to do. It has completed one of the country's biggest voluntary drainage undertakings.

Resourceful district directors raised most of the $70,000 needed for draining the 16,000-acre wet farming section.

Everyone pitched in to get the job done. Helping hands came from the California State Highway Department, the City of Dixon, Reclamation District 2068, the Solano County engineer, treasurer and council, U. S. Navy, the Dixon bank, Production and Marketing Administration, Soil Conservation Service, Pacific Telephone and Telegraph Company, Dixon Soil Conservation District, and some 61 farmer-owners of wet acreage. Dixon district directors successfully molded these friendly groups into a working team.

Crop yields on an average should double now that water-laden lands can be properly drained and irrigated.

As far back as the 1850's when early homesteaders and Spanish Land Grant farmers settled in Dixon, landowners wrestled with winter flooding from a network of creeks and streams, plus runoff from the English hills. Sheep grazers used to wince when they saw that potential supply of irrigation water. What a boost summer water would have given their early-day dryland pastures!

They All Worked Together

A vast area of wet lands is made productive when many groups give of their thought, energy, time, and money.

By HERB BODDY

JUST about everybody along Main Street in the up-and-coming town of Dixon in Solano County, Calif., can tell you a whopping soil conservation story. It is a true one about community teamwork, wet acres and democracy in action.

What you hear is this:

The Dixon Soil Conservation District—not

But when farmers began seeding improved pastures, and irrigating, in 1935 they ran into more water troubles. On leveling for border checks, old natural drainageways clogged up and water lay on lands well into spring. Even more vexing to them was the sight of their water spilling onto neighboring farms. Their tail water also raised the dickens with roads.

Dixon Valley farmers simply had more water than they could handle. More water problems lay ahead. These hustling farmers were not borrowing trouble, but they could see a lot more winter groundwater coming when the big Montecello water storage dam in the English hills northwest of Dixon was ready for irrigators.

More and more dryland farmers have been swinging over to irrigation, with the amount of new irrigated land running about 2,000 acres a year in Solano County.

There was also the prospect of a serious alkali problem should the water table keep rising.

What to do with all that extra water!

"We never had it so bad as far as water goes," say Eb Rayn and Charlie McGimsey, Dixon farmers. "Our lands were getting pretty well soaked in winter, bogging down winter and spring seeding and tillage work. Things were getting worse rather than better. What the Dixon area needed was a good drainage system. We feel our farmers got a lucky break when

Miller, McGimsey, Rayn, and contractor check over one of the plans for Dixon drain. Condition of gullied area after 5 growing seasons.

they hit upon the idea of getting drainage work done through a soil conservation district."

How Dixon area farmers set up their district is fast becoming a legend in the lower Sacramento Valley.

To marshal some 60 farmers and various agencies and groups to work for a common goal, called for some super-selling on the part of Charlie McGimsey, W. E. Rayn, Water Anderson, Arnold Collyer, Vernon Schmisner, Bill Tutt, John Dawson, Godfrey Priddy, Jesse Jones, and Bill Campbell, to name a few.

They made trips up and down the area contacting absentee landowners, visiting farmers in their homes, holding frequent meetings and discussions with Solano County and Dixon city officials. There were talks too with PMA, Soil Conservation Service, and other agencies participating in the preliminary planning. The "minutemen" campaigned for their drainage idea night and day.

About the time the 16,000-acre Dixon Soil Conservation District was organized in 1952, the enterprising farm leaders had the drainage program in the bag. Some $35,000 in cash was collected from landowners and pledges came in from cooperating agencies.

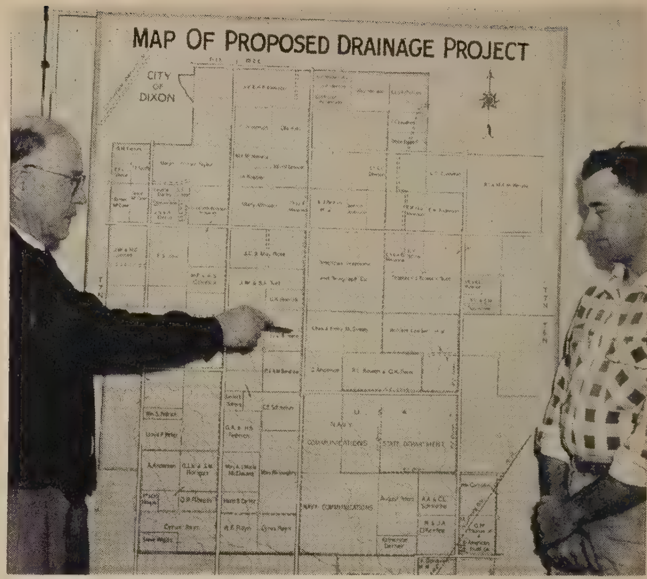
On hand, too, were voluntary easements and rights-of-way needed for ditching across farms. The district farmers also were ready with a practical plan for getting rid of surplus water —a plan arrived at with the help of SCS technicians Bob Miller and Ralph Bishop.

By September 1953, the district directors had the drainage work well under way. It was no small job to lay out 5 miles of main channel, nearly 24 miles of open-type lateral ditches, and to clean and shape 4 miles of old drainageways. It was a time for rejoicing when dragline rigs moved the last of some 185,000 cubic yards of earth in December. Sixty-three working days were needed to do what had been overdue a hundred years.

Dixon farmers are reaping real returns. Crop yields are soaring. Farmers are able to work their fields much earlier in the spring. They like the summer drainage, and the chance to do a better job of winter grain seeding.

Here are a few examples of the teamwork that made the Dixon Drainage Project possible:

U. S. Navy.—Used own rig to construct ditches on Navy property.



McGimsey and Miller take a look at the map.

American Telephone and Telegraph Company.—Paid ditching costs for 640 acres of its land.

Solano County.—Voted $17,000 for culverts.

Reclamation District No. 2068.—Permitted the soil conservation district to tie into several of its ditches. In turn the soil conservation district allowed use of one of their new channels. Districts jointly agreed to maintain drainage outlet to Hass slough.

City of Dixon.—If drainage system is extended to north, city will spend $1,200 for connecting construction.

Solano County Treasurer and Council.—Financial and legal advice.

Production and Marketing Administration.—ACP money for farm feeder ditches, plus one man's salary on survey crew. ACP money will reduce actual drainage cost for farmers by a third, or down to $2.50 per acre.

First National Bank of Dixon.—The banker made the job possible. He loaned money to various farmers for 2 years at 5 percent on their two-thirds payment. Some farmers didn't have the ready cash to pay for the ditching.

Soil Conservation Service.—Gave farmers technical and engineering assistance in laying out drainage system and planning irrigation improvements.

W. E. Rayn, one of those farmers who spearheaded the drainage movement, puts things this way, "Our farmers have said a good many nice things about the drainage work. But what seems

to strike them most favorably is that such an undertaking encourages independent thinking and action. There was nothing compulsory about our drainage project. Farmers could join in voluntarily, or they could stay out, as they pleased."

You can't blame those Dixon farmers if they appear a little puffed up over their accomplishment. Aren't their lands "high and dry," and isn't the drainage bill paid in full?

District-wide projects such as the Dixon drain serve as a testing-ground and showplace for wet land owners in adjacent areas. When tough drainage problems are worked out successfully, as in the Dixon Valley, it starts other folks to thinking and planning.

And that's what has happened to 75 farmers in two other areas nearby totaling 18,400 acres. They liked the way Dixon lands were drained, and have asked to be included in the district so surveys and engineering work could get under way. Some 30 miles of ditches and drains will be needed, say the technicians, to rid wet areas of runoff and overflow.

Associate directors, who are heading up the drainage program with a helping-hand from the Dixon Soil Conservation District governing board, hope to see the drainage job completed before fall rains set in. They expect fund-raising and community programming to be simpler and to click faster with the well-run Dixon drain as an example.

Basic To Every School Course

Conservation education in Brown County, S. Dak., reaches every rural pupil. It is worked into his regular studies, and supported through contests and field trips.

By RAY R. HUXTABLE

RURAL school children, teachers, and parents are all enthusiastic about conservation education in Brown County, S. Dak. Children like it because it is something they can grasp easily and see in their everyday life. Teachers find that conservation can be injected and correlated with a number of different phases of schoolwork. Parents are anxious to have their children know more about the things from which families derive their living. And most farmers would like to see their sons and daughters develop an interest in farming so they will stay on the farm when they are grown.

Conservation education in this county has received its sponsorship and incentive from the supervisors of the South Brown and Brown-Marshall Soil Conservation Districts, which cover the entire county. In addition to such support, the program has also received a great deal of aid from other sources, such as the county superintendent of schools, the Extension Service, the Soil Conservation Service, and the local newspapers. Prior to 1953 the two districts sponsored various projects involving essay, scrapbook, jingle and poster contests. The districts own slide strips and have provided a projector so that conservation films can be shown in the rural schools.

Soil Conservation Service technicians and the county agent have played an important part in bringing conservation directly to the schools. In 1952, all the county's rural school children were taken on tours to study soils and conservation practices. This past winter over half of the schools were visited and presented soil demonstrations. One or more district supervisors were usually present.

During the past school year, district supervisors promoted a conservation achievement program, copied after the Goodyear program

Note.—The author is work unit conservationist, South Brown Soil Conservation District, Aberdeen, S. Dak.

The author is pictured with winning teachers in 1954 Conservation Achievement Program. Teachers: Mrs. Ferdina Beck, Parkway School; Mrs. Donna Hubert, Houghton School; Mrs. Alma Rogers, Trail School; Mrs. Ray Johnson, Gage School; Shirley Widstrom, Bell School; Ruth Johnson, county superintendent of schools, and Lois Rogers, Prairie View School. Mrs. Mary Elliott, All Star School, was not present for picture. (Photo: Aberdeen, S. Dak., *American News.*)

for soil conservation district supervisors. This program gave the teachers a great deal of latitude in selecting the subjects that could be best accomplished in each school. Points were assigned for each activity connected with conservation. Credit was given for the use of films, slides and other visual aids, and also for collecting a suitable list of library references helpful in teaching conservation. Particular emphasis was given to activities carried out by pupils, such as making field tours to conservation farms to see conservation practices applied. During the year the children made scrapbooks, wrote essays and made posters. They also made collections of leaves, soils, weeds, and grasses. Extra credit was given for pupils reading their essays and putting on simple soil demonstrations before community meetings of adults.

Mrs. Alma Rogers, teacher of the Trail School, west of Aberdeen, and winner in the Achievement program, says, "My pupils and I found that conservation applies to many subjects. The parents of my pupils tell me that their children are taking a greater interest in the activities around the farm."

Milton Tostlebe, professor at Northern State Teachers College, visited six of the schools that won plaques, certificates of achievement, or cash prizes. He was particularly pleased to see how the teachers had worked the fundamentals of conservation into so many subjects, such as, arithmetic, spelling, geography, social studies, hygiene, and history.

Additional incentive came to the program this year when teachers began using the book, "Conservation of South Dakota's Natural Resources," which has been adopted as a regular part of the curriculum in South Dakota elementary schools. This book was developed in 1952 at a conservation workshop held at Northern State Teachers College. It was sponsored by the State Association of Soil Conservation Districts. The book contains the basic prin-

ciples for teaching a constructive course in conservation here in the midwest.

The South Brown and Brown-Marshall districts intend to develop their Conservation Achievement Program as a continuing project. Participation has been gratifying, and it is their belief that the program will grow each year as teachers become more familiar with the subject. A good number of the teachers in Brown County have taken a course in conservation at Northern State Teachers College. The two districts awarded scholarships to four teachers in 1953 which enabled them to attend this course.

Well started now, conservation education in Brown County has prospects of developing into a well coordinated drive which will afford the youth of Brown County a good basis for meeting the challenge of an ever changing and forward moving agriculture.

JOIN FORCES

(Continued from page 39)

exhibits, and arrange for conservation speakers at school meetings.

A few posters, mostly about forestry and wildlife, were displayed in the county courthouse the first year of the awards. The material resulting from teaching the subject has grown in volume, in quality of work and in scope of subject matter, until the displays this year became too voluminous for the courthouse and had to be shown at the individual schools. Judging in the senior high, junior high and elementary division of the 18 white schools and 21 colored schools took 8 days. More than 300 teachers and 9,950 pupils participated in teaching and learning about a complete soil and water conservation program.

The objectives of this program in the elementary grades are to create an appreciation for the soil and to help pupils realize that we are dependent on its proper use. In the junior high schools more details are learned about the effects of erosion on man and his institutions and what can be done to control erosion.

In the senior high schools more emphasis is given to the application of erosion-control measures on the land and to developing some skills in erosion-control work.

Second graders, proud of their drawings and booklets.

SCHOOL VISITS FARM

(Continued from page 37)

mentary school; S. P. Harris for vocational agriculture; and Mrs. Ray Nobles for science classes.

During the year many films were shown to thousands of children and teachers, essays were written, posters were made, soil types and rocks were collected, and many other activities were engaged in to learn more about conservation of natural resources.

This school is but one example of the many schools that are doing more each year to relate conservation of resources to subjects taught.

CONCERTED DRIVE ON LITTER.—In May representatives of 35 national organizations attended the first advisory council meeting of the newly organized Keep America Beautiful, Inc., in New York City. The total bill for the nation's trash collections and other cost of litter is believed to run between 40 and 50 million dollars a year.

Keep America Beautiful, Inc., was formally established on December 10, 1953. The corporation will be administered by a Board of Directors composed of nationally known leaders, recognized for their general contributions toward improvement of public welfare, and prominent throughout a broad range of American industry. All parts of the United States will be represented on this Board. The Advisory Council includes representatives of national public service organizations such as the National Wildlife Federation, whose objectives are consistent with the K.A.B. program. K.A.B. has its headquarters at 100 Park Avenue, New York City. Financial support has been provided by some of the nation's leading industries and trade organizations.

Camporee

THREE 1-gallon jugs intrigued visitors to a Boy Scout Camporee last spring at Lancaster, S. C.

The Scouts explained to several hundred interested persons the significance of the jugs and other exhibits on soil, water, forests, and wildlife. John E. Nisbet, Soil Conservation Service technician, served as adviser to the Scouts in making the displays effective.

One of the jugs contained water from a very muddy stream and another water from a clear stream.

The muddy sample told the story of excessive soil erosion in a watershed where lack of ground cover such as pasture or forest permitted the soil to be washed into the stream. The other sample depicted a watershed protected from falling raindrops by vegetation, which kept the runoff water clear.

In still a third jug the soil from the muddy stream had settled, showing the extent to which sediment was being transported.

The Scouts made it plain that ground cover, such as pasture, forest, hay and forage crops, protects the soil from falling raindrops.

These Scouts know that whether water in a stream is muddy or clear depends a good deal on the ground cover in the watershed: Billy Chapman, Walter Steele, and John Broadwater.

This cage of quail caught the eyes of visitors. Richard Steele was quick to explain that soil conservation benefits wildlife.

Visitors were also encouraged to take a long look at a soil profile—a 6-foot cross section of soil, removed and mounted in its natural position. Scouts noted that the thin, dark upper layer was topsoil, from which comes most of our food. Originally about 6 inches deep, it has been completely eroded away on millions of acres of land.

Below the topsoil, the subsoil graded into bedrock—the parent material of all soil. It takes nature a long, long time, the Scouts explained, to make an inch of topsoil from bedrock.

The moral, the Scouts pointed out, is that it is extremely important to save this thin layer of topsoil by following sound soil conservation methods.

To indicate the importance of trees in a soil conservation program, the Scouts observed that trees in a well-managed forest lay a continually increasing layer of leaf mold over the ground surface—a layer which absorbs water like a sponge. Trees also protect the soil, they said, against the pelting action of raindrops, as anyone who has sought shelter under a tree during a rainstorm knows.

How trees grow was seen in a cross section of a pine sapling, which had attained a diameter of 5 inches and a height of 21 feet in 4 years. The age of the sapling was indicated by the rings. Seasonal variations in growth—rapid in summer and slower in winter—were also observable in the rings.

An exhibit emphasized that the great enemy of the forest is fire, which destroys ground cover, kills young seedlings, and damages growing timber. Fire protection is important, too, because the forest is the home of wildlife.

All conservation practices increase wildlife on our farms—the Scouts were quick to declare—because they provide food and shelter for birds and animals. Birds, in turn, help the farmers by destroying insects and weed seeds. Plants such as bicolor lespedeza, planted around field borders and in odd corners, are especially valuable in providing food and shelter for birds, the Scouts explained.

Visitors also learned that farm ponds, another conservation measure, produce fish and provide resting and feeding areas for ducks.

OUTDOOR CLASSROOM.—More than 200 high school boys participated in 3 field meetings held on farms in Jackson County, Iowa, last spring. The events were sponsored by the Jackson County School Masters Association, in cooperation with the Jackson Soil Conservation District, Soil Conservation Service technicians, and Carl Warren, local wildlife conservation officer. The purpose of the field trips was to acquaint the pupils with practical conservation farming programs and their benefits, and also to find out what problems must be met in successfully adapting soil conservation methods to the land.

Nine public and parochial high schools were represented: Andrew, Bellevue, and St. Joseph's of Bellevue, totaling 45 pupils, attended the first meeting of the series at the Bennett Schwager farm northwest of Springbrook. The second group of 80 boys from the Miles, Preston, and Sabula high schools visited the Louis Lane farm north of Preston, while the third group of 85 boys from the Baldwin, Maquoketa, and Monmouth high schools visited the Ralph Owen farm west of the Maquoketa Caves State Park.

Observations made at the different farms included contouring, stripcropping, terracing, grass waterway development, channel improvement, tiling, improvement of permanent pastureland, erosion control dams, and wildlife cover areas.

Each cooperating farmer was present to greet the boys and tell them about his conservation farming program. All of them have been following the contour method for several years and say that they wouldn't think of going back to up-and-downhill farming on their sloping fields. In addition to reducing their soil losses, these farmers have increased their yields to a high level through use of the right combination of soil improvement and conservation measures.

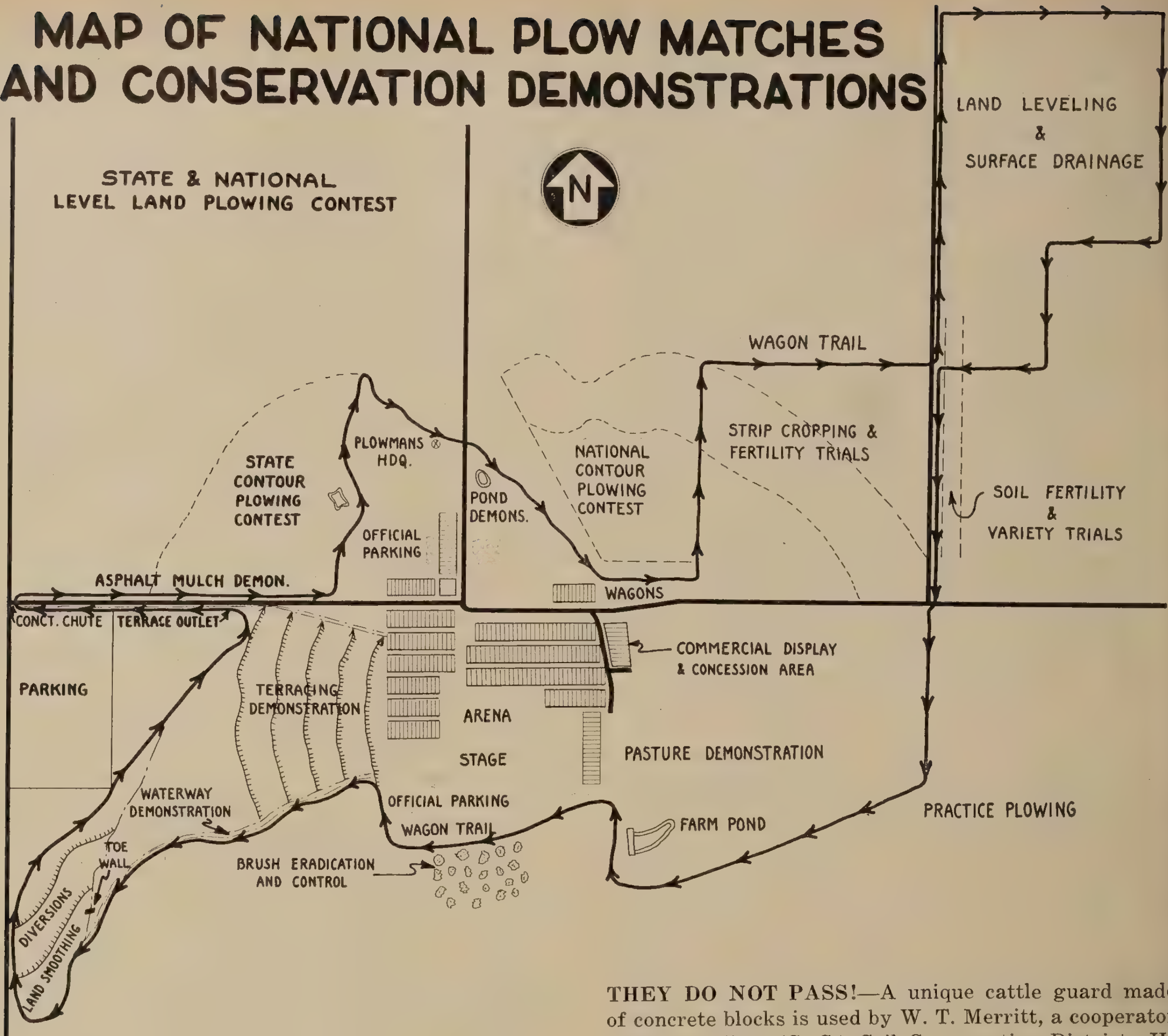
Floyd Parks, SCS farm planner, was in charge of the field meetings. He was assisted by Earl Kerker, SCS soil surveyor, and Warren.

Besides observing the practices noted, the boys were shown how to lay out a field for contour farming and given some pointers regarding the successful use of this practice. Kerker told what he looks for when making the soil survey of a farm, and explained the land capability map used as a guide when developing a conservation farming plan. Warren discussed the manner in which wildlife conservation fits into a soil conservation program, and pointed out that our beneficial wildlife needs food, cover, and water for survival.

Sponsors and farmers alike were well pleased with the attitude displayed by the boys on these trips and feel that whether they become farmers or not, they henceforth will have a better appreciation of the land and its care.

A stop at the farm of Ralph Owen.

MAP OF NATIONAL PLOW MATCHES AND CONSERVATION DEMONSTRATIONS



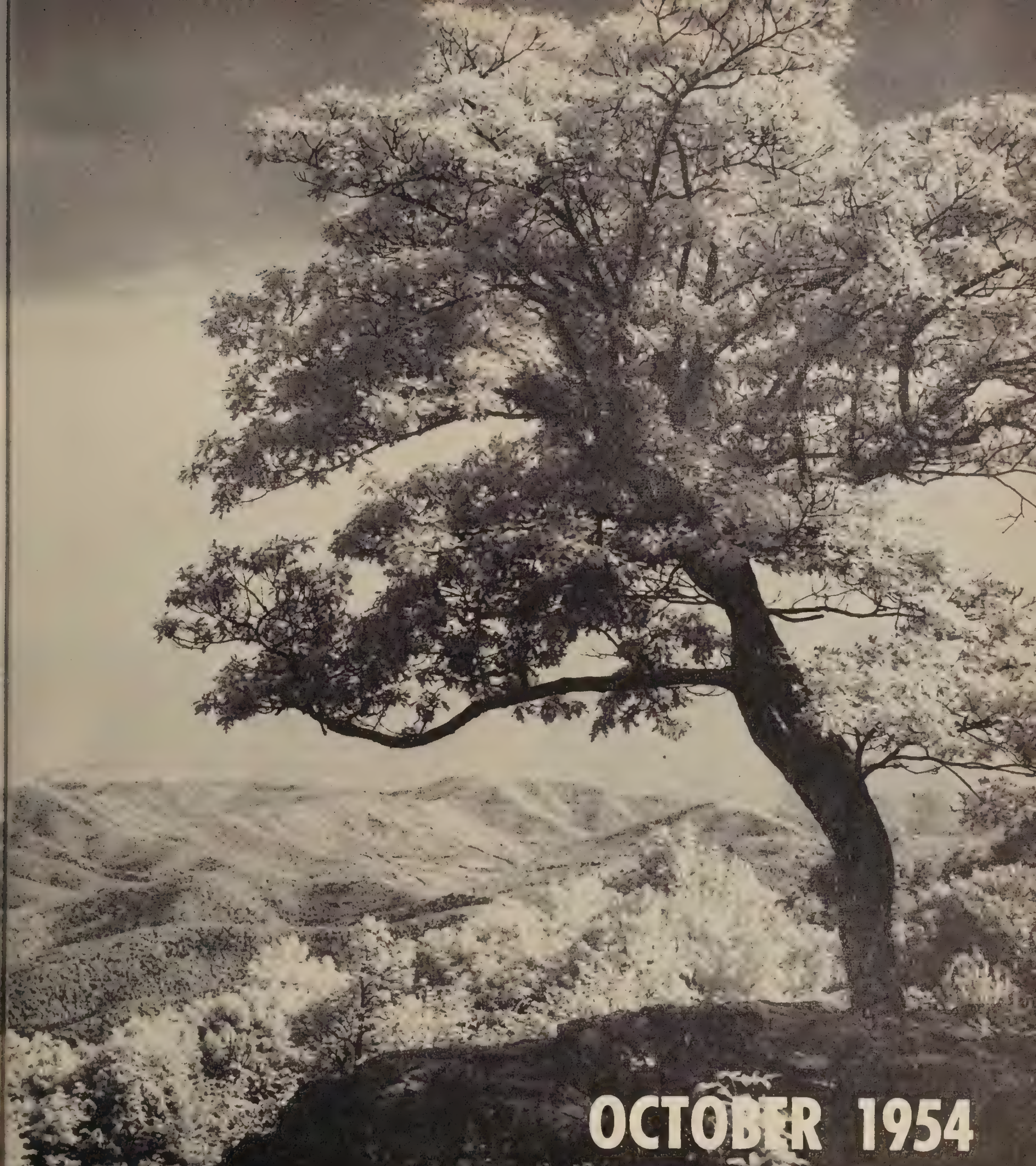
BIG TIME EVENT.—More than 100,000 people are expected to witness the 1954 National Plowing Matches and Conservation Demonstrations near Olney in Richland County, Ill., September 16, 17 and 18. This map showing the general site layout gives some idea of the scope of the 3-day event. It was prepared by the Caterpillar Tractor Co., which is one of the many farm machinery and implement firms cooperating in the event.

Thursday, September 16, has been officially declared Youth Day with all students from schools throughout Illinois being invited to attend as special guests. Friday the State Plow Matches get underway, and Saturday champion farmers from the midwestern states compete for the title of National Plowing Champion.

Soil conservation demonstrations will be conducted on each of the 3 days to show the latest developments in land smoothing, terracing, surface drainage, farm pond construction and other practices.

THEY DO NOT PASS!—A unique cattle guard made of concrete blocks is used by W. T. Merritt, a cooperator with the Edisto (S. C.) Soil Conservation District. He sets the blocks on end at the road level. Automobiles and other motor equipment pass over without difficulty, but Merritt says cattle and other animals cannot be driven across this type of guard. This makes it possible for him to use his various pastures and fields for grazing as provided for in his district farm plan without the inconvenience of gates obstructing the field roads.

METAL FIELD NUMBERS.—C. J. Ray, one of the supervisors of the Edisto (S. C.) Soil Conservation District, uses numbers cut from old automobile license plates to designate the fields on his farm as numbered in his farm plan. The section of a plate bearing the appropriate number is tacked to a fence post where it serves as a permanent marker and in addition to serving as a guide to his conservation operations, makes it possible for Ray to send workers to the proper field without danger of their getting mixed up or misunderstanding their instructions.



SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

SOIL CONSERVATION •

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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RESEARCH ON RESOURCES.— R. G. Gustavson, president and executive director of Resources for the Future, Inc., has announced that that organization will receive from The Ford Foundation a grant to support a program of research and education for a 5-year period at an average annual level of about $750,000.

"I am glad," Gustavson says, "that The Ford Foundation has expressed its confidence in Resources for the Future, and on a scale that will enable us to make a real start on work that very much needs doing. Some of the problems related to developing and conserving our natural resources already are critical and more may become so as our population grows and our economy continues to

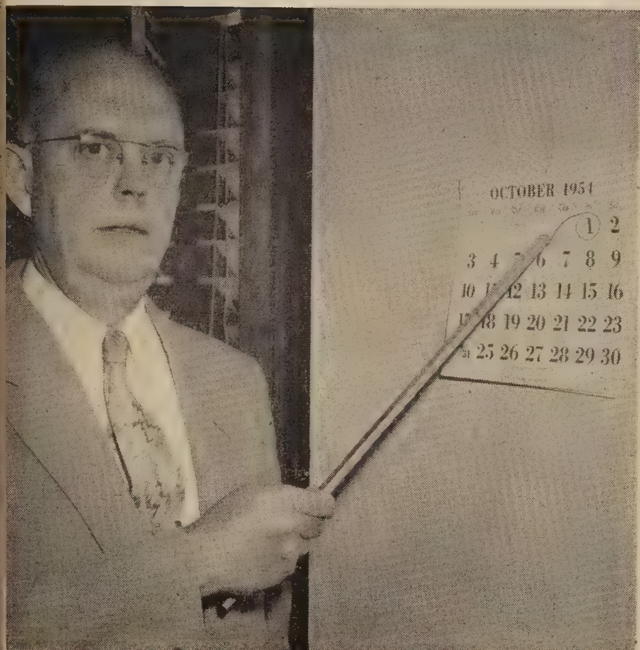
(Continued on page 68)

CONSERVATION DEGREE.—Announcement is made by Purdue University that, effective September 1, 1954, it will offer a course of study leading to the degree of Master of Science in Conservation. This new degree will be available primarily to graduate students under the direction of any of the three sponsoring departments of agronomy, biology and forestry.

FRONT COVER.—A woodland panorama in the Valley of Virginia from the Skyline Drive in the Shenandoah National Park. Photographer Hermann Postlethwaite used an infrared film and a 23-A filter, and released the shutter at 9:30 a.m.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Putting Research To Work On The Land



D. A. Williams points to date for "a new kind of report" mentioned in this article.

Here is something brand new in farmer-technician-researcher cooperation: A practical way to bring our scientific knowledge to bear on our agricultural problems.

By M. L. DuMARS

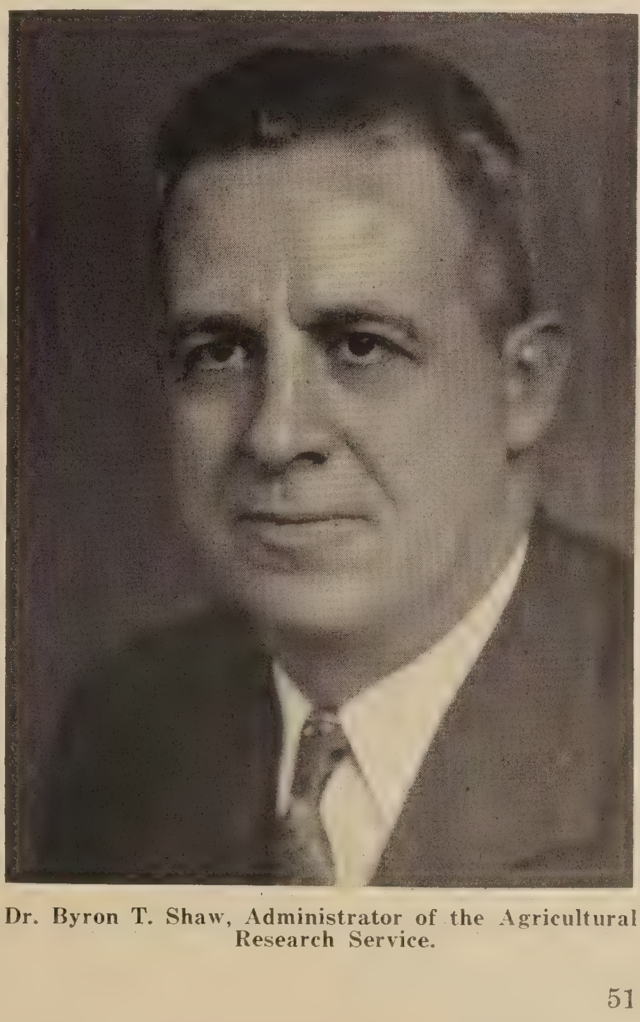
ON OCTOBER 1, SCS Administrator D. A. Williams, will present to the Administrator of the Agricultural Research Service, Dr. B. T. Shaw, a report on the Nation's soil and water conservation problems that call for scientific research.

This will be a new kind of report, and it signifies a new type of working relationship between Government agencies.

The report itself will be important but perhaps not so significant as what it symbolizes: The establishment of a definite system to "flag" conservation problems each year for the attention of the State and Federal officials who plan the country's agricultural research program.

Note.—The author is ARS-SCS liaison officer, Plant Industry Station, Beltsville, Md.

"Our objective," say Administrators Shaw and Williams in a joint letter to State college officials, "is to make sure the total research program of the country takes fully into account the conservation problems that are encountered



Dr. Byron T. Shaw, Administrator of the Agricultural Research Service.

by farmers and technicians working in the soil and water conservation program. If the Nation's conservation work is to be based upon scientifically sound knowledge, research into the unsolved problems is essential, and it is also necessary to make research results available promptly and continuously to the technicians and educators who work with farmers."

This autumn's pioneering national report of research needs will deal with *actual problems of real people on specific lands*—not with general principles. It will be used for discussions with the national research advisory committees, especially the soils-water-fertilizer committee; it will be used by research officials for the planning of new research projects and budgets and for the continuous adaptation of "going" research.

Important as the finished report itself may be, it will have served equally good purposes at many points along the preparation route.

It is worth while to note some of those good purposes.

First, the report will have required fresh, analytical thinking by the entire Service corps of operating technicians and staff specialists. Administrator's Memorandum SCS–40 says it like this: "Each state conservationist is responsible for developing an annual list of conservation research needs for his State . . . SCS field staff and other interested individuals and groups will present research needs to the state conservationist prior to . . . [May 1.]" Like making a budget, this calls for the solid thinking that strengthens administration.

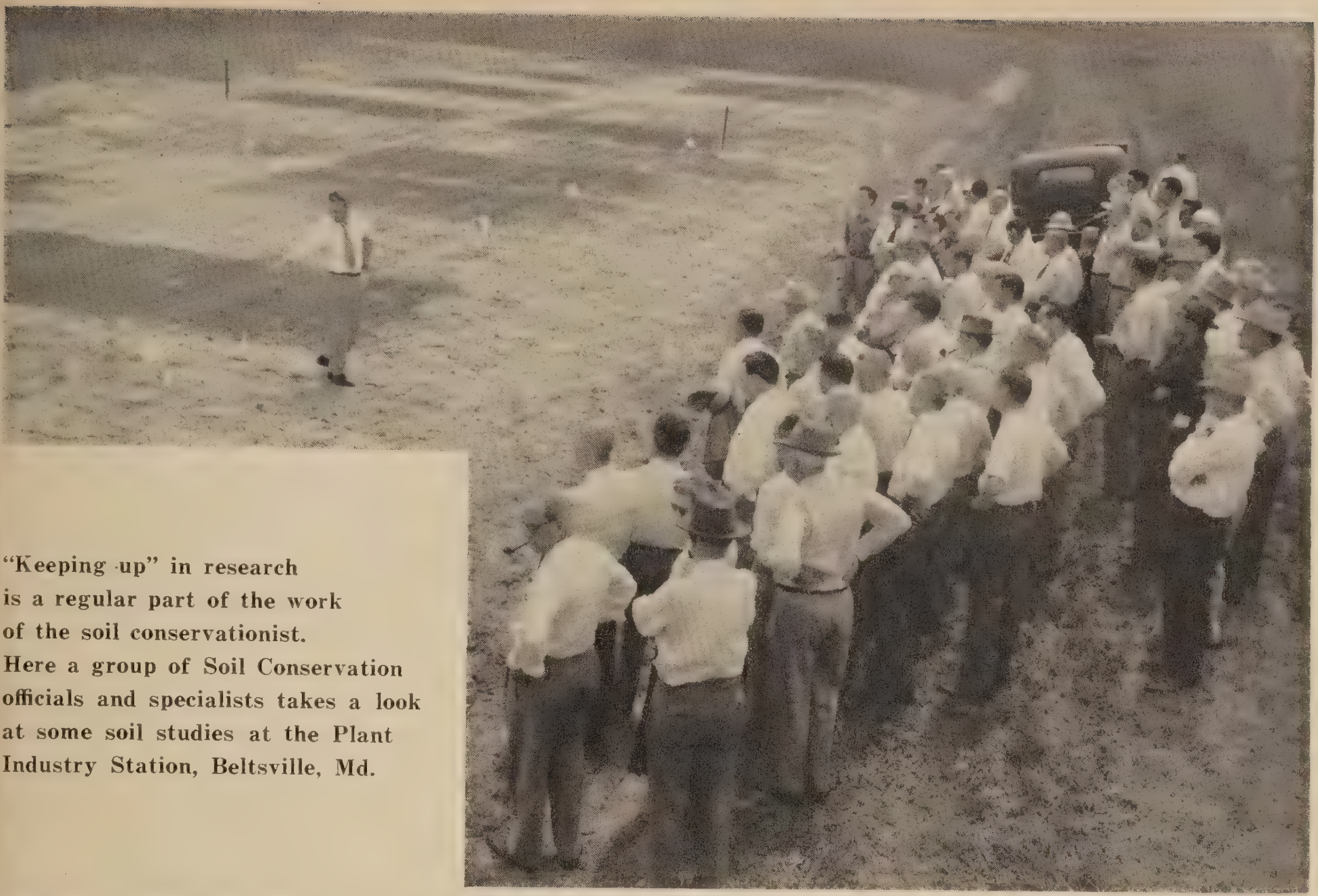
Second, the document on its way to completion will have required the advice of many private citizens, including many supervisors of soil conservation districts. It will have prompted the national and state associations of districts to begin the establishment of their own system of research committees.

State conservationists are instructed to "seek the advice of soil conservation districts, State conservation committees (commissions and boards) and others in developing the list of problems proposed for research solution." The National Association of Soil Conservation Districts at its meeting in New Orleans last February officially reconfirmed the report of its 1953 research committee recommending the establishment of district, state, area, and national research committees.

The National Association report said in part: "Districts should make definite plans for calling to the attention of their state associations the problems which are not being met and which may require new research. Each state association should have a research committee whose job it is to keep in touch with the research agencies and the state conservationist regarding both current and needed research. Means should also be provided for carrying unmet needs from the state level on to the area and national research committees and to the officers of the national association for further attention and action."

The third good purpose served by the report before it is finished is this: It provides an additional specific means of bringing together in the State representatives of State and Federal agencies concerned with soil and water conservation. The Administrator's Memorandum makes it clear that SCS will actively seek team play: "As a first step in determining the functional procedures to be used in each State in developing the annual list, the state conservationist will discuss with the state experiment station director and the state extension service director the desirability of creating a formal or informal committee for the systematic consideration of proposals and for the determination of major research needs in soil, water and plant conservation, in the State. SCS procedures in listing needs should be coordinated with the arrangements jointly agreed to by the state conservationist and the directors of the station and the extension service."

Prior to the reorganization of the Department, plans called for special research needs committees organized under terms of a proposed memorandum of understanding among SCS, ARS, and the individual state experiment stations and extension services. Now, however, a uniform system of committees is not considered to be necessary. As Administrators Williams and Shaw said in their joint letter to directors of state experiment stations and extension services, "We of ARS and SCS believe (and we feel sure the state institutions agree) that the objectives of the proposed agreement are still important and that we should strive to



"Keeping up" in research is a regular part of the work of the soil conservationist. Here a group of Soil Conservation officials and specialists takes a look at some soil studies at the Plant Industry Station, Beltsville, Md.

achieve them. We favor the use of State research needs committees as previously contemplated and will be glad to develop formal or informal arrangements to that end in any State. We do not consider a uniform system of committees to be necessary.

"SCS is making its state conservationists responsible, as far as that agency is concerned, for the necessary consultations with state experiment station and extension service directors and with federal research workers in the State regarding research needs. This may be done through an organized inter-agency committee in states where it is the consensus of agencies that a committee is desirable. In other states the committee may function on an informal basis."

The Experiment Station Committee on Organization and Policy took the following action at its meeting the latter part of April:

"ESCOP recommends to the state experiment station directors that a committee be formed in each State, composed of representatives of the experiment station, the extension service, and Soil Conservation Service, to systematically consider and list the research needs in soil and water conservation in that State."

The Extension Committee on Organization and Policy approved a similar resolution at its April meeting.

It can be seen that much thought and planning have gone into the arrangements for reporting officially the conservation problems of the country, state by state.

Fourth and not least among the good purposes served is the fact that the state agricultural experiment stations will have had the benefit of the state reports from which the national report is compiled. In fact, the national list will indicate what the state stations are doing and hope to do toward meeting each unsolved problem.

"When the state list of research needs is agreed to by the committees," again quoting the Administrator's Memorandum, "the state conservationist will consult the state experiment station director in regard to the extent to which research needs can be met with State resources."

State reports of conservation research needs, wherever possible, are developed by committees made up as desired by the interested State and Federal agencies in the State. Here is the Utah research needs committee at work on July 20. Left to right, the members are A. J. Webber, soil conservationist, SCS, Salt Lake City; D. A. Burgoyne, assistant director, Utah Agricultural Experiment Station; Alvin Carpenter, assistant director, Utah State Agricultural Extension Service; Howard Peterson, professor of agronomy, Utah State Agricultural College; Louis Jensen, extension agronomist, U.S.A.C.; Bliss Crandall, assistant director of the experiment station; C. H. Milligan, head, department of irrigation and drainage, school of engineering, U.S.A.C.; Cyril Lauritzen, soil and water conservation research branch, Agricultural Research Service, Logan; George A. Lawrence, civil engineer, SCS, Salt Lake City; Josiah Libby, SCS state conservationist, Salt Lake City; Sheldon Winn, SCS range conservationist, Logan; John W. Metcalf, SCS soil scientist, Salt Lake City. Others taking part in meeting but not shown in picture include Wayne C. Cook, range management division, U.S.A.C.; and Bill Bennett, agronomist at the Utah experiment station.

The general understanding is, of course, that the Federal research planning will begin at the point where State efforts leave off.

By August 1 the state conservationist sends a copy of the state report to the SCS Administrator. (State research needs committees will be free to make additional uses of the report if they wish.)

From the state reports, the national report will be compiled by an SCS National Research Needs Committee appointed by the Administrator.

That brings us to the final report itself. Let's take a closer look at it to see what it is—and what it is not.

Is it only what its name implies—a prosaic list of problems? It would be important enough if it turned out to be that only.

But it is far more.

During its preparatory stages, as we have seen, it serves as an instrument of cooperation.

In finished form, it will be a mirror of the future.

Look into it and you may see the makings of your work plans in the years to come. You will see the subjects of handbooks, guide sheets and job sheets on which you may be working 2, 3, 5 or 10 years from now. You will see the topics of future bulletins, reports, talks, and other communications designed to fill the gaps in people's knowledge of conservation principles and techniques.

You will not see in the mirror the total program of SCS. The report will not mention the problems that are being met effectively every day on the basis of present know-how. It will touch lightly, if at all, upon the questions into which researchers are already delving. And, to most of us the "research needs" that don't get into the final report will have more immediate significance than do those which survive the the screening.

What is a "research need?"

It is merely a need for facts we don't have.

Fortunately, not every suggested "research need" actually calls for research. Sometimes

the needed facts are available. The problem is to dig them out of their hiding places in publications, desk drawers, and people's heads and to get them to the people who have said they need such facts.

It is at least as important to find out that a field technician is in need of information which is already available as it is to learn that he needs facts which can come only from a brand-new research project.

Field staff workers of SCS are already busy responding to the fact-needs expressed in preliminary lists and discussions of research needs.

No one can yet foretell the full effect of this new guide for staff and administrative activity. *Certain it is, however, that the pinpointing of field problems will help immensely in the planning of training programs, technology workshops, guide sheets, publications, and all categories of field work.*

Thus, the reporting procedure provides a guide for the present as well as for the future. It is a guide for the placing of emphasis, the eternal balancing trick in any agency dealing with a complex of problems.

The ARS branches concerned with soil and water conservation need this kind of a guide as much as do operations personnel. They not only must plan research but must plan and prepare reports, technical papers, publications and other materials with which to meet the needs of program workers and farmers. When they know specifically what facts are needed, they can weave together the new results of research and the previously known facts so as to make their reports increasingly useful.

Dr. Robert M. Salter, who lately headed the SCS and now is chief of the Soil and Water Conservation Research Branch of ARS, stressed the need for precision in planning research and reports when he spoke at the Red Plains Conservation Experiment Station field day near Guthrie, Okla. He said, "The Agricultural Research Service recognizes a great responsibility to the people of this country for research into problems of soil and water conservation. We are attempting, in cooperation with the state experiment stations, to tailor research projects to the exact needs of the soil conservation program. We want to make our research results available quickly whenever we have something worthwhile to report so that extension education, the technical assistance of SCS, and the financial assistance of the agricultural conservation program can represent at all times the latest and best knowledge that science can provide."

The fact-needs to which attention is called through the new reporting process can be likened to the red-marked route on a road map. We follow the route, but we need the rest of the map for reference. ARS must not only provide information that follows the marked route but must also provide many related points of reference through reports and publications.

Dr. Robert M. Salter, Chief of the soil and water research branch, Agricultural Research Service.

General publications are being exchanged by the two organizations. Policy with respect to division of responsibility on publications has been jointly developed and agreed to. ARS will continue the former SCS practice of compiling and distributing abstracts of published material on soil and water conservation.

The Soil and Water Conservation Research Branch will issue quarterly reports designed especially to keep SCS personnel abreast of developments at all project locations.

Project annual reports and other administrative materials are made available to the jointly employed research liaison representatives and, through them as needs indicate, to other staff members of SCS. In fact, the liaison representatives are given free access to the reports and personnel of ARS and are afforded a special fact-finding service. They may select the person from whom they want to ask information, or they may ask me to find the right person and get the information for them. Although administratively responsible to the SCS assistant administrator for field services, they are included in ARS staff conferences wherever possible and are invited to sit with official technical committees. Close as the relationship is, however, the liaison representatives are not to be exclusive channels between the agencies. One of their constant duties is to facilitate close working relationships among all SCS and ARS personnel.

Important among the ways in which field technicians may obtain the facts of science are technical workshop conferences and field tests and trials. Administrators Williams and Shaw in their letter to State college officials mentioned the workshops as "valuable aids to cooperation," adding that "we favor these and all other means of arriving at common understandings on technical problems and of maintaining good day-to-day working relationships."

Field tests and trials are to be conducted cooperatively with the research liaison representative working with state conservationists, other SCS personnel, research workers, and soil conservation districts in planning and conducting them.

Trouble-spot consultation is a form of cooperation that thrives as people get acquainted, and a healthy trend is showing up. A land use problem in Missouri, soil salinity in Texas and Oklahoma, poorly drained spots in Maryland, soil compaction in New Jersey—those are a few of the subjects and places that have drawn research and program men together recently for field inspections and discussions. Within the obvious limits, we can look for much more of the same.

Best of all, perhaps, a great many strangers are turning out to have first names.

And isn't it funny how often people with first names turn out to be able and friendly and actually interested in the same problem we ourselves are wrapped up in?

"We of ARS and SCS feel that we must work together as members of the same administrative unit (which, indeed, we are, considering the Federal-States Relations group as a unit)," say Administrators Shaw and Williams, "and we desire to cooperate just as closely with the state experiment stations, state extension services, and other agencies responsible in any degree for conservation research and education."

The research needs report and the work back of it are means to that end.

These Things We Have Learned

The author here reviews some of the basic knowledge obtained from experimentation with soil and water.

By JOHN LAMB, JR.

LIMITED measurements of soil losses by erosion were started in Missouri in 1917, North Carolina 1924, and Texas 1926. In 1929 the United States Department of Agriculture started eight experiment stations through the middle west, Ohio, and southeast. These were for the

Note.—The author is research liaison representative for the Northeast, Soil Conservation Service, College of Agriculture, New Brunswick, N. J.

express purpose of measuring soil and water losses. Thus, was laid the foundation for the Soil Conservation Service. Within 5 years the first major erosion stations were established in the Northeast, in the States of New York, Pennsylvania, New Jersey, West Virginia and Virginia.

At these stations the major factors in soil erosion were studied: soil cover, degree and length of slope, the natural erodibility of the soil, and runoff in relation to rainfall intensity. Thousands of measurements were made, and the relation of each factor to soil loss was well enough established to justify combining into a soil loss formula. With this, under many conditions of plant cover, slope, soil, and rain intensity, it was possible to make a reasonably accurate estimate or prediction of soil erosion loss. The principles so developed made it possible to plan methods of control that were effective and profitable.

Soil Cover

Plant cover and any litter on the surface of the soil protects it from the beating action of raindrops. Even stones were found to help hold soil in place. Raindrops, and especially the large drops of a thunderstorm, fall with a lot of force. Two inches of water over an acre weighs 226 tons. When the drops fall at the rate of 20 miles per hour, which is not unusual, 2 inches exerts enough energy, when it hits the soil, to lift the plow layer 3 feet high. The plow layer weighs some 1,000 tons per acre. Fortunately, that much water never hits the ground at one time, but it is not especially unusual for 2 inches to fall in a period of 30 minutes.

Any leaves or materials that absorb the energy of the rain before it hits the soil are very effective in reducing soil loss. The roots of crops hold soil against the tearing, abrasive action of running water. In New York on the Bath flaggy silt loam soil, not too much unlike some of the potato soils of Maine, clean, cultivated, fallow land lost 10 tons of soil. At the same time, corn, continuous with no fertilizer, lost 3 tons. Corn well fertilized and grown in a rotation of corn, oats, and clover lost only one-tenth of a ton of soil. The corn was planted on the contour. A meadow mixture of grass and clover lost almost no soil—a mere trace.

The tops and roots of thrifty crops offer a great deal of protection. The larger yields leave more top and root-growth residues to keep up the supply of active soil organic matter. On the Bath soil mentioned above, removing the stones above 2 inches in diameter increased the water runoff from 13 to 20 percent of the rainfall, and the soil loss from 4.3 to 12.7 tons per acre annually.

In an experiment in Illinois after the corn ears were harvested, the stalks and leaves were broken down and left on the surface. They were removed from a plot nearby. Then a rain occurred in which 1.75 inches of water fell in 1 hour. Where the cornstalks were on the surface only 14 percent of the water ran off, and the soil loss was one-tenth of a ton. Where they were removed, water runoff was increased over 5 times, and the soil loss was increased 16 times.

More Slopes, More Erosion

The water runoff and soil loss was measured from a rather friable, well-drained soil in New York where the slope was 9 feet per 100 feet length, and also where the slope was just twice as steep. On the latter both the runoff and the soil loss were doubled. On the same steepness of slope, where the length was doubled from 75 feet to 150 feet, the soil loss was increased, but not doubled. In thousands of measurements over the central and eastern part of the United States there was much the same result. In general, the steepness of the slope was more important than the length. If the degree and length of slope were known, along with the erodibility of the soil and the intensity of the rainfall, the soil loss for a certain crop could be calculated.

Most of these measurements were made on relatively short slopes of 300 feet or less. The erosion was sheet erosion, in which the water runs over the ground surface in thin sheets before it gathers into flows that gouge out gullies.

Intensity of Rainfall

This brings us to the next factor in erosion, and a very important one—intensity of rainfall. At one location in New York in 8 years there were 177 rains that caused erosion from a bare soil. On a soil much the same as the potato soils of Maine, these rains lined up in a definite order. The faster the rain fell, what we call the higher the intensity, the more the

soil loss. The soil loss would start in approximately 15 minutes in a rain falling at the rate of an inch per hour. Of course, if the rain fell faster the erosion would start sooner. One time 1½ inches of water came in about 30 minutes, 1 inch of which fell in 10 minutes. During that 10 minutes fine topsoil washed off to the extent of 8½ tons per acre. A study of the rainstorm records in New York revealed that these high intensity thunderstorm rains occurred chiefly in the summer. In the interior of the state 80 percent occurred from May 15 to September 15. Near the seacoast the same trend was evident, but not so clean cut.

Again, it was found that this change in erosion with a change in rain intensity could be calculated with a fair degree of accuracy.

Natural Erodibility of Soil

In addition to the behaviorism already mentioned, soils vary in their inherent ability to resist the action of raindrop impact and moving water. For example, taking an average of 7 years, the Dunkirk silty clay loam lost approximately 6 tons of soil per acre the first 10 days in August. One mile away, an Ontario silt loam lost 4 tons per acre in the same period. Both soils were clean cultivated fallow and had the same length of slope. The Dunkirk was a 5 percent slope, the Ontario an 8 percent slope. The same soil may vary in its erodibility due to past soil management and the condition of soil structure or tilth.

With the many measurements of soil erosion made from many different soils over the humid parts of the United States, it is possible to list most soils in the order of their erodibility. Here, as in all the factors listed, continual research is needed to build a better and better program for control of soil erosion. At this stage of development, however, there was a sound factual foundation for estimating total soil loss. At the same time, there was accumulating a valuable store of information on the quality of the soil lost.

Quality of Eroded Soil

Sheet erosion is a highly selective process. The soil organic matter is concentrated in the surface layer. The raindrops churn the soil into a dispersed suspension, and the lightweight organic matter and fine soil particles are carried down the slope by rain splash and thin sheets of water. It was found in New York that 95 percent of the topsoil washed from a 75-foot slope would pass through a 25-mesh sieve. Only 29 percent of the plow layer on the same slope would pass through the same sieve. This was a stony silt loam soil. Biological analysis by Wilson and Schubert showed the eroded soil contained 100 times as many of the aerobic soil organisms as the surface soil in place. Neal worked with a sandy loam on the coastal plain. The eroded material contained 4.7 times as much organic matter, 5.0 times as much nitrogen, 3.1 times as much P_2O_5, and 1.4 times as much K_2O as the original surface soil. The potash was 3.7 times more available.

Differences noted above depend on the soil. Where the soil is all fine, such as the one silt loam of lacustrine origin in New York (with the exception of organic matter) Slater and Carleton found there was little to differentiate the wash and soil.

The selective loss of fine soils, high in plant nutrients and waterholding capacity, has been summarized by Uhland. He found that crop yields decline even with the loss of the first inch of topsoil. The decline continues steadily as the depth of erosion increases.

Erosion Means Lower Yields

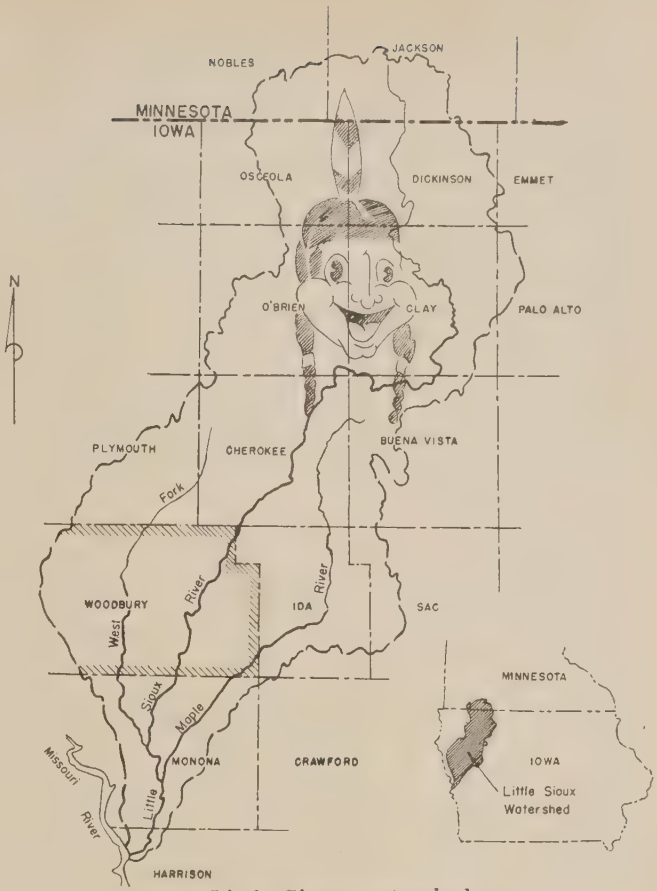
A good soil is one that has organic matter and small soil particles to facilitate the chemical and biological changes that go with high production. Sheet erosion steals both organic matter and fine soil particles. Grass and legume mixtures practically stop erosion and build up organic matter. In New York plots of stony hill soil were allowed to erode while on others erosion was held in check. A thousand pounds per acre of 10–10–10 fertilizer and enough limestone to grow clover was applied. Corn was then planted. A plot held fallow for 11 years, that had lost 135 tons of soil per acre, made only 19 bushels to the acre. An adjoining plot, in grass the same period with only one-tenth of a ton soil loss—and that the year of seeding, made 88 bushels. At Geneva, N. Y., on a limestone soil, the difference between the eroded fallow plot and the non-eroded grass plot was 40 to 106 bushels per acre. Another productive limestone soil in recently eroded land, after 2 years of soil-building with grass, made 49

Soil conservation districts had their beginnings in western Iowa in the early nineteen forties after 9 years of demonstration work (much of it on a watershed basis) in erosion control dating back to 1933. The first task for the new districts was to acquaint the farmers with the problem and to help them take the first simple steps on the road back. The Extension Service and other agencies, both local and national, helped to get the problem before the farmers and urban people alike. Slowly, contouring of row crops began to take root and spread; grassed waterways began to appear where small field gullies once were a problem; a few miles of terraces were built each year on the less severe slopes and the use of legumes and grasses in crop rotations became gradually more evident. By the middle forties, progress looked good by any previous standards, but it wasn't nearly good enough. Soil and water were still running wild.

In 1946, the Soil Conservation Service set about to carry out an authorization from Congress to retard flood runoff and reduce sediment damages on watersheds and the Little Sioux flood prevention program came into being. being.

The program first had to be integrated into the regular soil conservation districts program. Each soil conservation district governing body thus became a local sponsoring group, controlling local district policy as it affected flood prevention activities in its district. To coordinate the thinking of the many district governing bodies involved, the Little Sioux Works Committee was set up, comprised of 1 member from each of the 12 district governing bodies involved in the Little Sioux basin. This committee has guided the progress of the program through the 8 years of its existence.

From the beginning small watersheds have been the focal point of this integrated effort. There has been good cooperation among these watershed groups in carrying out the simple conservation practices such as contouring, better rotations, grassed waterways, etc., but the cost of controlling the silt and water losses from these watersheds by means of detention reservoirs and stabilizing structures, along with these simple conservation measures, has been very high. Costs of contract work were high



Little Sioux watershed.

and rising through this period. Of course, much of the benefit was downstream but off-site benefits are difficult for people to understand. Consequently, many questions were asked. Local people criticized the cost. Congressmen questioned the cost and the degree of participation by landowners on whose farms the work was being done. District commissioners and others who were guiding the policy were seeking not only lower costs but more effective methods of doing the job.

Level terraces have long been known to work well in the deep windblown soils of western Iowa. These soils have a high infiltration rate. Besides that, they are low in clay content and high in silt, tending to make them droughty. They need all the water that falls each year to produce high yields of crops.

Guy Wooster, farmer and district governing body member near Mapleton was heard to say: "Terrace these farms and you should not only be able to reduce the number of structures needed but the size of those that are left." Many people began to wonder if Wooster didn't have

Bulldozer reshapes a terrace to provide additional capacity, Woodbury Soil Conservation District.

units in 12 small watersheds. There were only minor amounts of terracing in these treated watersheds. At that time, the Works Committee, governing bodies of the various districts and the Soil Conservation Service, jointly made a review of accomplishments under the flood prevention authority to date and concluded that means should be explored and tried to improve the overall aspects of the program, as well as to keep the costs down. This was a large order. To everyone working with the problem, it meant an extensive terracing program.

At the meeting of the Little Sioux Works Committee on September 30, 1952 each district governing body was urged to contact local PMA Committees to determine their willingness to

Agency representatives take stock of progress in application of level terraces with special ACP assistance. This is in the Clift watershed, Woodbury County Soil Conservation District.

something. Ralph Wilcox, farmer near Correctionville and secretary of the Little Sioux Works Committee, said: "There may be some small watersheds that can be adequately controlled with terraces and good land use programs alone." Glen S. Law, farmer near Pierson and manager of the Woodbury County Agriculture Stabilization Conservation Committee office said: "My farm has slopes of only 3 to 5 percent and it has been completely terraced for 15 years. Honestly, I don't believe there is ever a drop of water that leaves that farm any more."

By the summer of 1952 the Little Sioux Flood Prevention program had treated about 200 farm

set aside extra funds for terracing and waterway development in small watersheds that were developing their land treatment and conservation programs prior to assistance from the flood prevention program. Several PMA Committees pledged some additional help for the program year 1953, but the only county which took full advantage of this trial run was Woodbury. Two small watersheds took advantage of the offer, set up their farm needs for terraces and waterways in advance, with the help of the district governing body, SCS technicians and the PMA Committee, and carried it out to completion during 1953. Thirty miles of terraces and 14,000 cubic yards of waterway filling were ac-

Severe gully erosion. Average annual maintenance cost of bridge on public road was $1,100.

complished in these two small concentrated areas. An additional 120 miles of terraces were built in the Woodbury district during the year 1953 and, when the ground froze up in early December, interest was still rising. Many small watershed groups of people were asking for help to get organized so they could petition PMA for similar special help with their terracing and waterway program during the 1954 program year. Before the year ended, nine small watersheds organized and petitioned the Committee (now designated ASC) for special help, and pledged to build 300 miles of terraces and do waterway work to the extent of 158,000 cubic yards of earth.

Are they carrying out these intentions? The best answer to that is the fact that during April and May this year more than 200 miles of terraces have been built in the Woodbury district and most of them are in these nine small watersheds. Altogether, 500 miles are requested by farmers for 1954 in this one district alone. This work is being done almost entirely with bulldozers owned by private contractors. Watershed groups and individual farmers make their own contract arrangements. Since many of these terraces go on steep slopes and because many small sidehill gullies are crossed at times, bulldozers are the most efficient machines available. Why do we terrace steep slopes? Because they are being farmed. During April this year 24 bulldozers and 4 machines of other types were building terraces in the Woodbury district.

This looks to everyone like the real thing. First, it is the watershed approach, which has never been questioned as a sound method of handling the soil and water conservation problem. Next, it allows the watershed group to

Water detained by level terraces and a detention reservoir, following a 3-inch rain. This is in the Anthon watershed, Woodbury County.

organize with a three-man committee of its own to handle its group affairs, call meetings, handle petitions, contract negotiations and many other things. It concentrates the work of SCS technicians, saving time in travel compared with the "shotgun" method, and resulting in more time spent in actually getting conservation on the land. Conservation practices are bunched and concentrated in an impressive way and every farmer is doing many of the same things as his neighbors. He is not an "island unto himself." The watershed approach in the Little Sioux places each watershed in competition with many others for the high priority position in getting added help from the flood prevention program with major gully and flooding problems. Each watershed group knows at the outset that it must do its job of sound soil and water conservation first before it can be considered for flood prevention assistance. The Little Sioux Works Committee spelled out the responsibility for all when it resolved that "flood prevention funds be used to aid watershed groups with those practices desirable in flood control which are beyond those normally found in a sound farm conservation plan."

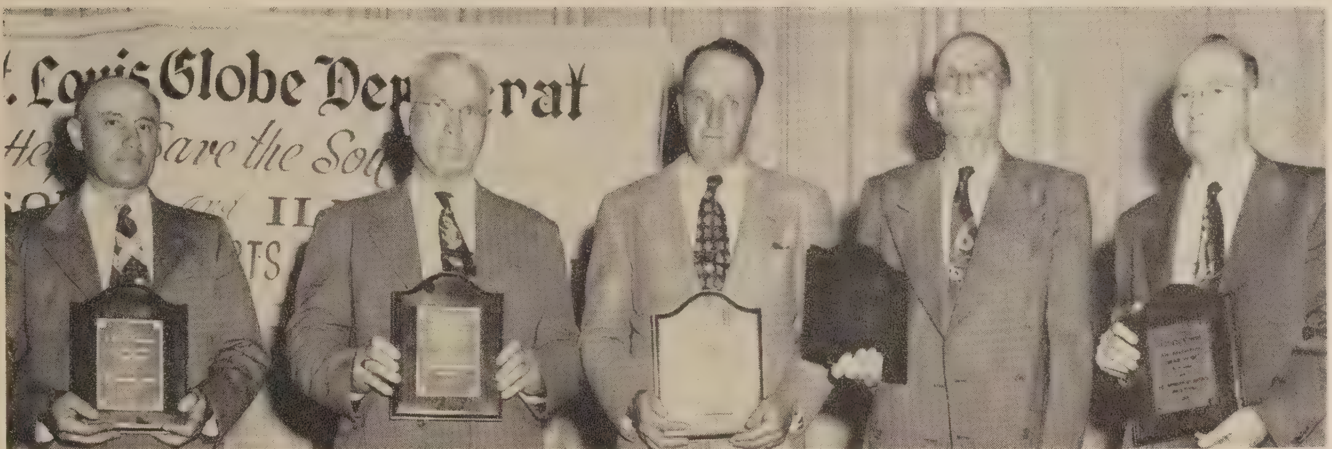
The costs of applying flood prevention measures to small watersheds which have extensive level-terrace systems are much lower and may go lower still, as more experience is gained with this approach to the problem. These cost reductions in many cases run 50 to 65 percent below those found under earlier design criteria. There is a good probability that some small watersheds may be found that can be completely treated without the high-cost conventional concrete structures. This reflects the practical application of the statement made by Ralph Wilcox and quoted earlier.

On-the-farm benefits from this approach are far above those realized under former methods. Soil and water losses are negligible from these

(Continued on page 68)

Ten Years Of Service Marked

Gov. Donnelly proclaims "district month" in Missouri. Farmers, townsmen and newspapers join in observance.



Supervisors of winning district in Area 5, Southeast Missouri: A. H. Webb, Steele; J. L. Burlison, Wardell; J. Wesley Shrader, Hayti; Henry A. Boone, Caruthersville; and W. J. James, county agent and secretary to the board.

By **HOWARD C. JACKSON**

IN JUNE, for the first time, Missouri observed "Soil Conservation District Month," by proclamation of Gov. Phil M. Donnelly. Placards announcing that "We join with Gov. Donnelly in congratulating Missouri's Soil Conservation Districts on 10 years of progress" were widely displayed in stores.

"Modern conservation," the Governor pointed out, "has come to mean more than keeping soil and water where it belongs. Conservation farming now means higher productivity and better standards of farm living." This theme was stressed during the month's observance.

Joining soil districts in observing the month was the St. Louis *Globe-Democrat,* long a conservation leader and notably successful in conducting the Soil Conservation Districts Awards Program in Missouri and Illinois.

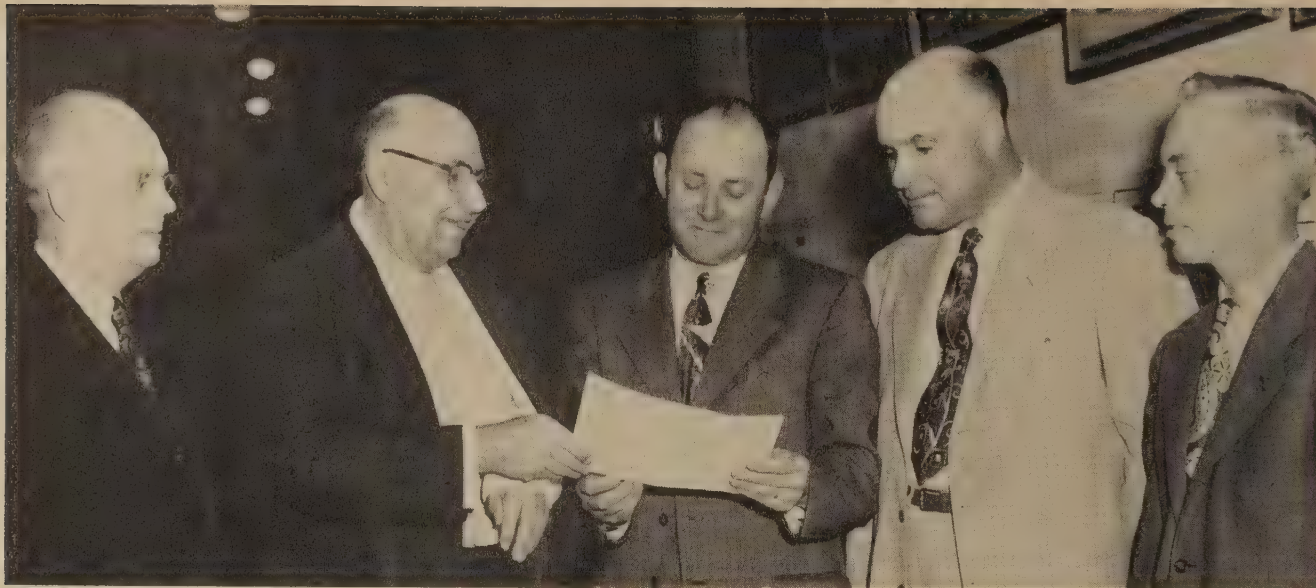
The *Globe-Democrat* program is unique on several scores: It is the only newspaper program that covers all of two states; it stresses community and district effort rather than individual achievement; and it is most impressive in the incentives offered.

Note.—The author is deputy state conservationist, Soil Conservation Service, Columbia, Mo.

The sweepstakes prize in each state is an all-expense trip to the National Association of Soil Conservation Districts convention for eight persons from the winning district. Last February eight persons from each state were guests of the newspaper at the NASCD convention in New Orleans. The winning groups were brought to St. Louis, where they were guests of honor at a dinner. They were taken on a sightseeing tour to Mobile, Ala., and along the Gulf coast to New Orleans. This year the winning districts were in Harrison County, Mo., and Effingham County, Ill. Next spring the *Globe-Democrat* will take the state winners to the 1955 convention in San Diego, Calif.

In addition to the sweepstakes prize, recognition is given to five area winners in each state. Last spring approximately 4,000 persons in the two states attended the area recognition parties, heard addresses on conservation by nationally known speakers, saw the directing boards of the winning districts receive bronze plaques, and enjoyed a program of entertainment. Donald A. Williams, Administrator of the Soil Conservation Service, addressed recognition parties at Olney, Ill., and Hayti, Mo.

Conservation received wide publicity before and after the parties. As the chairman of the



Charles C. Clayton, executive assistant to the publisher, St. Louis *Globe-Democrat*, presents citation of merit award to work unit staff attached to Pemiscot Soil Conservation District. Left to right: D. A. Williams, Administrator of Soil Conservation Service; Clayton, Harry Barker, work unit conservationist; Robert Axon, agricultural engineer; and Albert Howard, engineering aid.

Pemiscot County district board put it: "We are grateful for the award we received, but more particularly for the impressive boost given our district program."

The *Globe-Democrat* augments and supports its recognition of the importance of conservation and the soil district movement with news stories, pictures and editorials throughout the year, reminding urban readers as well as farmers of their stake in preserving and improving the fertility of the land.

In both states the program is carried out in cooperation with the Soil Conservation Service and the state associations of soil conservation districts. Representatives of the Service and of the state associations serve on the advisory committee, which is headed by Charles C. Clayton, executive assistant of the *Globe-Democrat*.

As Clayton puts it, "We at the *Globe-Democrat* believe that soil conservation is a year-round job. We believe that the soil district, working with the SCS, offers the democratic and the most effective way to get the job done. We seek to encourage support of the soil district program, both by farmers and by businessmen and industrialists."

Now in its third year, the *Globe-Democrat* program is firmly established as a permanent part of that newspaper's public service.

THE LITTLE SIOUX

(Continued from page 66)

terraced areas. The water goes into the ground for increased crop production and sidehill gullies disappear.

There is an urgency in the air these days in the Woodbury Soil Conservation District. Watershed groups are moving fast to make up for lost time and wasted opportunities. Thanks to a farsighted and extremely cooperative ASC Committee, which has the courage to set aside half or more of its funds to further the watershed movement, and to the excellent cooperation of schools, news outlets, local and governmental agencies and many others, we believe the pattern is set and that in 21 years the watershed approach to conservation in the Little Sioux area has really come of age.

RESEARCH ON RESOURCES

(Continued from page 50)

thrive. Demands upon our soil and water resources are rising every year, as also are demands on the nonrenewable mineral resources—fuels, metals, and the rest—of our country and of other lands.

"The way in which these issues are met will be of deep concern to everyone in the country."

How To Get The Story Told

A speaking contest can bring sound results when carefully conceived and conducted.

By ROY PRING
President, Board of Supervisors
Fountain Valley Soil Conservation District

THE El Paso County (Colo.) Chapter of the Soil Conservation Society of America is an unusual group. These men—bankers, ranchers, lawyers, builders, grocers, salesmen, farmers, doctors, educators—have several things in common. They all live in or near Colorado Springs, Colo. They are all interested in conservation. At their monthly meetings they dearly love to "let their hair down," and especially to heckle their speakers. They have had the honor and privilege of badgering some of the finest speakers in the State, including Governor Dan Thornton. Although the speakers have all survived this ordeal and taken the comments in the spirit of fellowship with which they were given, it is with trepidation that anyone accepts the assignment of honored guest.

All this changed at the society meeting on May 19, 1954. Fay Holmes, a charming young high school senior, well knew the group's reputation. She came before that group of 80 men, smiled, and in a clear, soft voice told them of her stake—and theirs—in soil and water conservation. The proverbial pin was not dropped, but it could have been heard. When Fay finished, the men stood and applauded.

Many of the group, as individuals, had contributed financially toward the program that produced Fay as a conservation speaker. Before adjourning, the group unanimously voted to contribute an additional $150 from the local society's funds.

I tell you of this meeting because it epitomizes the results of the Fountain Valley Soil Conservation District's conservation contest. Let me briefly introduce the district board responsible for this contest:

Selby Young is a born conservationist who worked at it professionally as area conservationist in the Soil Conservation Service, and on his own farm and dairy. He is at present the president of the Colorado Association of Soil Conservation Districts.

John Janitell was also born to the soil. His own ranch south of Colorado Springs shows his devotion to conservation. Johnny also operates a highly successful business in the city.

Colonel H. E. Kloepfer is the only member of the board who is not a born agriculturist. However, the colonel (cavalry) certainly is adept at conservation. On retirement he purchased a rundown ranch that is now rejuvenated and reclaimed.

Clarence Foster operates a successful farm and ranch. He has long advocated conservation, and he practices what he preaches. He has held every office in the State soil conservation board, as well as those in his own district.

Ralph Swink is our county agent and ex-officio board member. He not only has an exceptional agricultural background, but he contributes immeasurably to all board meetings and endeavors.

This group has long been concerned with conservation education. For years it offered a scholarship to the Colorado State Agricultural College for any student in the area who would study conservation. It was indeed disheartening that no one had sufficient interest even to apply! Money was put aside for an educational fund to help with worthwhile projects. We were able to accomplish some good through Boy Scout and Girl Scout groups. We also had district signs made for all cooperators, and large signs for the district boundaries.

We still were not satisfied. The Board felt we needed a new program to accomplish the following aims:

1. Create an interest in conservation and to disseminate information on conservation to the general public.

2. Get conservation information into the schools.

3. Inform local business people of their dependence on conservation.

The Fountain Valley conservation contest was designed to answer these needs. We had big ideas and little money. Perhaps that was our most fortunate circumstance. Framed certificates were prepared that proclaimed the holder was a "Fountain Valley Conservation BOOSTER." Armed with these plaques, conviction, and a persistent disposition, the board members approached our local businessmen. The Chamber of Commerce agricultural committee contributed $200. Individual businessmen contributed $25 apiece. Banks, feed stores, lumberyards, hotels, contractors, and others also contributed. We obtained more than enough to finance the first year's contest—and have only started.

The contest was open to any high school senior who resided within the district or attended any of the eight high schools. In order to reach as many people by personal contact as possible we had a "speaking" contest. At the same time we wanted to facilitate the selection of the finalists, so we had them submit their material in written form. This gave us accurate data for newspaper publication.

The school libraries were all provided with "information kits" on soil and water conservation, obtained from the SCS office in Albuquerque, N. M.

Students were required to write a speech on the subject. "My Stake—and Yours—in Soil and Water Conservation." It was to be around 2,000 words, requiring approximately 15 minutes to deliver.

To stimulate interest we offered attractive awards. It was our hope that the winners would proceed with an education in conservation, and yet we did not want to eliminate many students with previous commitments or predetermined pursuits. Consequently, we provided a choice between scholarships to our state agricultural college or half their value in cash. First prize was a 4-year full-tuition scholarship, or $300 cash; second prize was a 2-year, full-tuition scholarship, or $150; third prize was a 2-year, half-tuition scholarship, or $75.

The district board acted as judges. Consideration was given to—

1. Attention stimulation
2. Knowledge of problems
3. Need for action
4. Relation of people to problems
5. Arrangement of ideas
6. Clarity of presentation

Fifty points were allowed, each judge giving each entry a grade up to that maximum. An average grade was then determined for each entry. On this basis the finalists were selected; however, due to a tie, it was necessary to end up with four winners instead of the contemplated three.

The four winners, notified of their selection April 7, were advised to arrange for as many speaking dates as possible for themselves. A maximum of 10 points was to be allowed for talks given prior to the final judging. The number of points each one would receive depended on the diversity of groups before whom they spoke, the number of people spoken to, and so on.

Final judging occurred May 12. This judging was limited to presentation—the effectiveness of the speaker. The judges, with 40 points maximum to award, were confronted with four exceptional individuals, and a point or so could easily change their relative standings. The board realized that this was a rough assignment and felt that qualified outside help was advisable. For this reason the following men were called in to serve as judges on this phase: Kenneth Chalmers, state conservationist; Charles Terrell, Colorado extension conservationist; Senator Vernon Cheever, State senator from the Colorado Springs area; and representatives of both local newspapers.

When the final judging was completed it was merely a matter of adding figures. There were a possible 100 points for each finalist—50 points for the essay, 40 points for the presentation, and 10 points for previous deliveries. The contest was close. Fay Holmes scored 95; Anita Sue McTeer 94, and Dick Foster and Bill Dooley 92 each.

That evening Fay Holmes was the speaker at our first Fountain Valley Contest Award Banquet.

Thus, our first contest officially ended. But its benefits will never end. Fay has continued to give her talk to groups that have requested to hear her. The interest that was stimulated

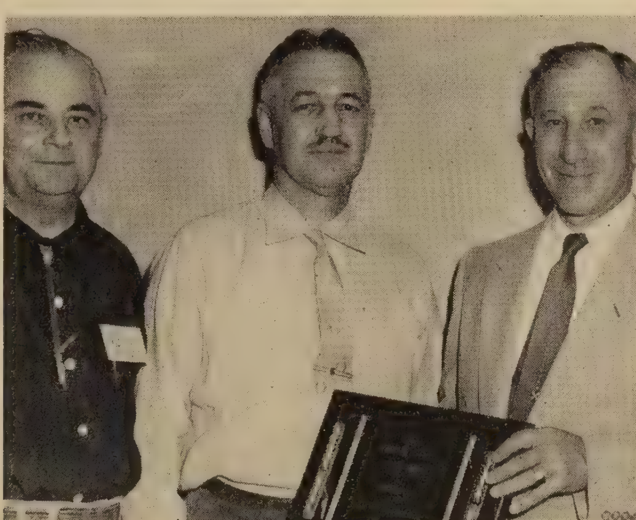
in the other contestants will never die. People who heard these youngsters are going to be more understanding toward conservation needs of the future. There were over 2,500 people in the audiences where these students personally appeared. Each winner gave his talk over the radio, and on our local television networks. The essays were printed in full in the local papers. Other papers picked them up.

The principal of one of our larger schools requested additional conservation kits and more information. He intends to start a course in conservation or incorporate it into the existing program this fall.

The district has received many commendations on this contest. The number of people reached cannot be estimated. The businessmen's response, however, has guaranteed the program's continuation. Although we did not expect to ask their aid every year, many have expressed their desire to contribute annually. How can we refuse?

HONORED FOR ARTICLES.—Adrian C. Fox in June was presented a special plaque, at the annual convention of the North Dakota Wildlife Federation, in recognition of his many years of contributions to the *North Dakota Outdoors*, a monthly periodical of the North Dakota Game and Fish Department.

Over a period of 10 years, Fox contributed some 135 articles. He is widely known as a biologist and information specialist. A veteran employee of the Soil Conservation Service, he now is deputy state conservationist, Bismarck, N. Dak.



Left to right: Howard Stone, president emeritus of North Dakota Wildlife Federation and director National Wildlife Federation; Adrian C. Fox, A. R. Kernkamp, president of North Dakota Wildlife Federation. (Photo by Pershing Carlson.)

DUCKS COOPERATE.—The Louisiana Gulf Coast is the end of a flyway for millions of ducks. Rice farmers have learned to cooperate with these valuable game birds, to mutual benefit. When too little rain has fallen, many farmers, prior to arrival of the birds from the north, pump water from their irrigation wells and use it to flood rice stubble land.

Crop contents from two ducks showing obnoxious plant seeds. Picture below contains a high percentage of red rice, which lowers the grade on the market.

Fields which are infested with red rice and other obnoxious plants are selected for duck ponds. Ducks feed on the red rice and other seeds, and this activity sometimes results in an increase in yield of rice of a better grade. These flooded areas, for varying periods of time, are small refuges for literally thousands of ducks which glean from these fields enormous quantities of very desirable food.

Ducks feeding in flooded rice stubble on the farm of Lee and Raymond Bebee, Iowa, La.

Ducks formerly used the Louisiana Gulf Coast prairies as feeding and resting grounds, prior to the advent of rice growing. Increases in population, improved cultural practices, and the addition of cattle as an integral part of farm operations, altered conditions greatly.

Ducks have always been known to utilize the ricefields. But the idea of flooding rice stubble probably came from farmers who observed how ducks took to ricefields hit by storms that made harvesting impossible. The ravenous consumption of rice in storm-swept fields indicated a possible shortage of feed in the native marshes nearby. This led to establishment of rice-field duck ponds.

It would be conjectural, of course, to intimate that the creation of a ricefield duck pond by a farmer is altogether removed from the sport of duck shooting.

The amount of undesirable seeds consumed by the ducks is told by Tom Thomas, Gulf Coast Soil Conservation District supervisor, who remembers when commercial shooting was done in this area. The commercial shooters, according to Thomas, obtained from the crops of their daily take sufficient grain to feed their home flocks of poultry during the shooting season. We can be glad this type of industry is connected with an era that is in the past.

—J. P. Maxwell

ANIMAL VANDALISM.—Woodchucks' holes are many times the reason for washouts and extensive soil erosion starting in fields, according to the Connecticut Extension Service. An example of this was the C. W. Larson and Son Farm, Portland, during the past winter. The heavy rains started a washout in alfalfa fields which will require 10 dump truck loads of soil to fill in and level up so field equipment can be used in the lot.

A PLACE TO LEARN.—In April the Riverside, Calif., Chapter of the National Secretaries Association held its fifth annual "Secretary for a Day" program. On this day schoolgirls interested in business careers come into business offices and take over the duties of members of the association. This year, 45 girl secretarial students from the Riverside Polytechnic High School and Riverside College were chosen for such training, to learn firsthand what a position in the business world is like.

The Soil Conservation Service area office looked upon this as an opportunity to do some educational work in soil and water conservation through the experience which would be carried back to the school by its student representative. A high school girl, Miss Carol Smart, was assigned to the office and spent the day carrying out routine duties such as taking dictation, running the ditto machine and answering the telephone.

In a letter commenting on her experience, Miss Smart wrote: "I will remember that day as long as I live because I had such an enjoyable 8 hours. At the same time I learned a great deal about the duties of the soil conservationists and the actual office procedure."

LEAGUE'S CHOICE.—*Virginia Wildlife*, the official publication of the Virginia Commission of Game and Inland Fisheries and edited by J. J. Shomon, has been picked by the Izaak Walton League of America as the best state conservation magazine in the nation.

GRASSLAND INTEREST.—Over 200 Waukesha County, Wis., farmers plan to renovate pastures. Many have taken soil samples.

NOVEMBER

1954

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

SOIL CONSERVATION

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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NATURE'S CONSERVATIONISTS.—Farmers living in the headwaters area of Perche Creek in Boone and Randolph Counties (Mo.) credit beaver with providing their main supply of livestock water last summer.

In an 8-mile area of upper Perche, the stream would have been completely dry except for the dam-building paddletails.

In one fisheries study 26 major beaver dams were counted that impounded water from waist to shoulder depth. Numerous lesser dams were also found for a total of 48 in the upper 4 miles. The beaver pools contained bullheads, green sunfish, carp suckers, redhorse and bass.

WELL SAID!—There recently appeared in the *Bergen Evening Record*, Hackensack, N. J., an AP dispatch which read:

"LOST MOISTURE—Hastings, Nebr. (AP)—After a heavy rain, a farmer complained: "I had 110 percent runoff—100 percent water and 10 percent farm."

This really is most graphic and expressive . . . I have never seen anything drive home more simply and effectively the point of farm soil erosion.

—Hiram B. D. Blauvelt

FRONT COVER.—The reward for a conservation program that includes wildlife! This hunter, at the end of day, returns home with a fat cock pheasant. Gordon S. Smith caught this excellent sunset silhouette in Lancaster County Pa.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Saline and Alkali Soils—Their Diagnosis and Improvement

A report on the salt problem in irrigated agriculture, and on the work of the U. S. Salinity Laboratory.

The U. S. Salinity Laboratory, Riverside, Calif., showing main building, greenhouses, and buildings housing soils laboratories, machine shop, and conference room. The Rubidoux unit is not shown.

By H. E. HAYWARD

THE salts of the earth are essential to life on our planet. It would be impossible to grow the crops needed for fiber, food, fuel, and shelter without salts containing nitrogen, phosphorus, potassium, calcium, magnesium, and other nutrient elements which contribute to soil fertility. On the other hand, if the amounts of chlorides, sulfates, borates, and carbonates are high, saline and alkali soil conditions are likely to occur, and these constitute a salt problem which is a major consideration in the maintenance of a stable irrigated agriculture.

In general there is a close correspondence between the occurrence of salty soils and low rainfall. Saline and alkali soils are seldom found in regions where rainfall is sufficient for agriculture because rainwater is essentially free from salts and the soluble material is leached from the root zone of the soil profile and carried away in the drainage water. Thus, the salt problem is peculiar to regions of arid and semiarid climate where irrigated agriculture is practiced, and rarely occurs in humid regions, except in cases where the soil has been inundated

Note:—The author is director, U. S. Salinity Laboratory, Riverside, Calif.

by sea water in river deltas and other low-lying lands near the sea.

The original source of the salt constituents is from the primary minerals that are found in soils and in the exposed rocks of the earth's crust. For example, it has been estimated that the average chlorine and sulfur contents of the earth's crust are 0.05 and 0.06 percent respectively, and sodium, calcium, and magnesium occur in amounts of 2 or 3 percent. Although weathering of the primary minerals constitutes the source of all soluble salts, there are probably few cases where this process alone results in a saline soil. In most cases, saline soils are formed by the transport of salts from other locations by water. The ocean is also a source of salts and many marine deposits such as the Mancos shales which occur in Colorado, Utah, and Wyoming are high in saline constituents. Less frequently, as in some parts of Australia, salt is moved inland by the transportation of spray by winds. The most common direct source of salt is from surface and ground waters, all of which contain dissolved salts in varying concentrations. These waters may add salts to soils as a result of flooding of low-lying land or because the ground water rises close to the surface. When used for irrigation, waters act as sources of salt and the salinization and alkalization of extensive areas of irrigable land may be attributed to the application of irrigation water that is high in total soluble salts or in sodium.

Irrigated agriculture is the backbone of the economy of many of the Western States; and, because irrigation and the salt problem are closely related, the extent of irrigation is significant. According to the Agricultural Census of 1950, the acres in irrigation on farms in the 17 Western States were: Pacific States, 8,334,169; Mountain States, 11,642,484; and Plains States, 4,292,263—a total of 24,268,916 acres from 33,850 reporting farms. This represents an increase of over 7,000,000 acres since the Census of 1940. Hawaii has approximately 117,000 acres under irrigation. In 1950 irrigation in the 31 Eastern States involved approximately 1,500,000 acres, an increase of about 100 percent since 1940.

What is the extent of the salt problem in irrigated areas? No precise answer can be given because of a number of factors. These include

Saline soil in the Grand Valley, Colo., showing salt accumulation in the furrows of an abandoned field. The salt content of the soil in the root zone exceeded 2 percent on a dry-weight basis.

the absence of complete data based upon reliable soil surveys, the constantly shifting intensity of the salinity hazard, reflective of good or unsatisfactory methods of land and water management, and the wide variation in injury due to salt which may range from slight reductions in yield to severe or complete loss of crops and outright abandonment of irrigated lands. Estimates of the magnitude of salt injury vary from 12 percent of the irrigated land to as much as 25 or 30 percent. The latter estimates are based on surveys which in some cases include potential irrigable lands as well as those now under irrigation.

Salty soils are those which contain too much soluble salts or too much sodium or a combination of the two conditions. A better understanding of the salt problem is possible if the characteristics of saline and alkali soils are understood. The U. S. Salinity Laboratory has defined these soils in non-technical terms as follows: a *saline* soil refers to a low sodium soil that contains sufficient soluble salts to impair its productivity; an *alkali soil* contains sufficient

exchangeable sodium to interfere with the growth of most crop plants; and a *saline-alkali soil* is one which is both saline and alkali. This classification is based upon measurements of the concentration of the solution extracted from a saturated sample of the soil as determined by an electrical conductance method, and the exchangeable-sodium percentage of the soil as determined by chemical analysis. In each case, limits and standards have been set up which are determined by precise measuring methods.

The threat of salinity and sodium problems has long been recognized, and soil scientists and agricultural workers of State and Federal agencies have contributed many valuable research findings bearing on these problems. It is generally agreed that the salt problem is a regional one, and the passage of the Bankhead-Jones Act in 1935 provided for additional assistance in its solution by making Federal funds available for agricultural research on regional problems. At a conference held in Salt Lake City in 1937, among representatives of the agricultural experiment stations of the Western States and the U. S. Department of Agriculture, agricultural problems of regional importance were considered. It was agreed unanimously that the salt problem in irrigation agriculture merited first priority; and it was decided to establish a Federal laboratory at Riverside, Calif., to conduct research on problems connected with the success and permanence of agriculture on saline and alkali soils.

A saline-alkali soil in the delta area, Utah, showing white crust and salt puffs characteristic of highly saline conditions. Exchangeable sodium was high, but the soil contained sufficient gypsum so it could be reclaimed by leaching without the use of amendments.

A moist alkali spot, "black alkali," in the Emmett Valley, Idaho. The problem soils in this area are characterized by low salinity, high sodium percentages, high water tables, and low rates of infiltration and permeability.

In 1938 a site was selected at the foot of Mount Rubidoux, about a mile from the center of the city and adjacent to the Rubidoux Laboratory, which was organized in 1928 to conduct research on the quality of irrigation water and the toxicity of boron to plants. Because their activities were so closely related the Salinity and Rubidoux laboratories were combined in one organization in 1948. Owing to the occurrence of the salinity problem in the 6 Plains States and the interest of state research workers in the program of the laboratory, official cooperation was extended, in 1951, to include all of the 17 Western States and Hawaii. The Laboratory is now under the administration of the Soil and Water Conservation Research Branch in the Agricultural Research Service.

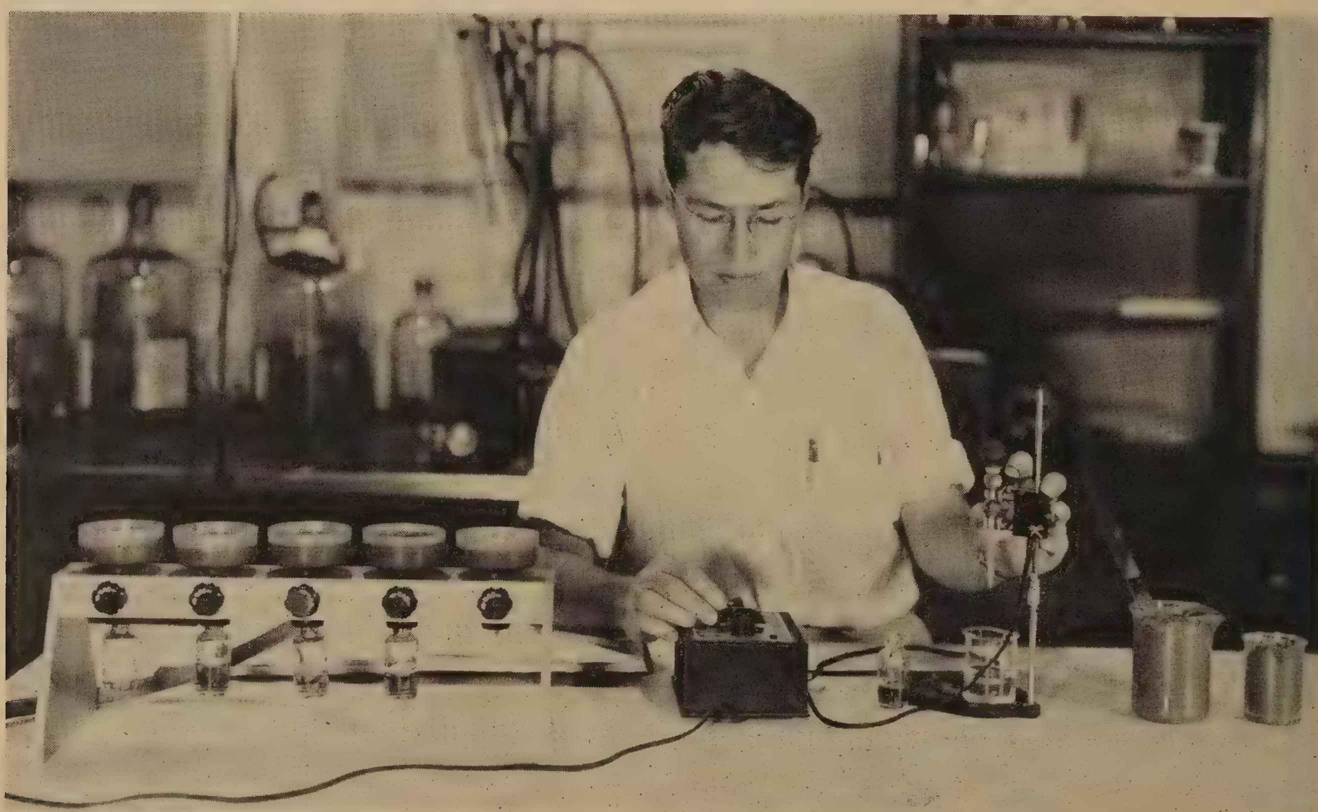
The Salinity Laboratory is unique in being the only research institution which is devoted exclusively to the study of the salt problem. The staff consists of a closely-knit group of scientists who are specialists in the fields of soil physics, soil chemistry, water chemistry, plant physiology, and agricultural engineering. Including the supporting group of sub-professionals and clerical personnel, there is a total of 35 members on the staff.

The research program of the laboratory includes the study of crop production on salty soils; the chemical and physical properties of saline and alkali soils as they relate to irrigation, drainage, and soil management practices; the salt and sodium tolerance of crops; and the quality of irrigation water.

Problems that have been studied and the progress that has been made are illustrated by the following examples. The diagnosis and improvement of saline and alkali soils would be impossible without accurate measuring methods to determine their chemical and physical properties. An important objective of the research program has been to develop new or improved methods for chemical analysis, and special equipment for measuring physical characteristics of soils and determining the moisture status of soils. For example, recent improvements have been made in a soil solution extractor and an electrical conductivity bridge for the determination of the salinity of soil and irrigation water. The new equipment combines portability at a low cost with sufficient accuracy for diagnostic purposes. A more widespread appraisal of saline soils should help to avoid the failures which farmers may experience when crops are planted in questionable areas without advance information concerning salinity. New chemical methods which have been developed include procedures for determining the amount of exchangeable sodium and magnesium in soils. Without such information, it would be impossible to decide upon the amounts of gypsum or other soil amendments which may be required to reclaim saline-alkali and alkali soils.

Current studies on the salt and sodium tolerance of important crop plants include investigations on fruit trees, forage, and vegetable crops; lists of crops showing their relative salt tolerances are now available to agriculturists. Information on the salt tolerances of crops may mean the difference between success or failure in cases where the soil is slightly to moderately saline. The relationship of planting and irrigation methods to the germination of row crops on saline soils is being investigated in cooperation with the Southwestern Irrigation Field Station at Brawley, Calif. It has been found that in soils where salinity is a factor, the use of modified practices of planting row crops may increase the emergence of germinating seeds of some species by as much as tenfold.

The quality of water used for irrigation is an important consideration in western agriculture. Studies have been conducted on the occurrence of boron in toxic quantities, and on



Standard equipment for obtaining solution extracts from saturated soil, and bridge for determining salinity status by electrical conductivity measurements.

Test plots to determine the salt tolerance of irrigated crops. The plots are pre-treated with water containing sufficient salt to establish the required soil salinity levels for tolerance tests.

the effect on soils of using waters containing excessive amounts of bicarbonate. A revised classification of waters based on their suitability for irrigation has been developed, which takes into account the salinity and the sodium content as hazards to crop production. Salt-balance studies have been conducted in cooperation with other agencies to determine the trend of salt accumulation in several of our important watersheds. These investigations provide useful information as to whether or not current methods of irrigation and drainage are adequate to control the salinity problem.

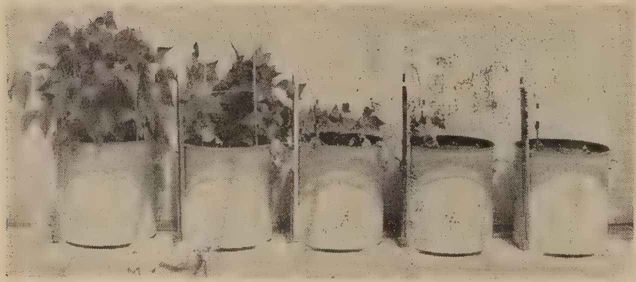
Staff members also serve as advisors to State and Federal agencies in technical matters related to saline and alkali soils. Since its establishment in 1938, the laboratory has cooperated in more than 40 projects which have been undertaken in all of the Western States and Hawaii. The objectives of these cooperative investigations cover a wide range of subjects, including characterization and classification of saline and alkali soils, field methods for the control of salinity by drainage, reclamation of saline and saline-alkali soils by leaching, use of soil amendments to reclaim alkali soils, and the relationship to sodium soils of soil-moisture characteristics such as soil permeability and infiltration rates.

Investigations on the control of saline and alkali conditions may be illustrated by the studies in California, Colorado, Idaho, and Oregon.

In the field of agricultural engineering, a project is in progress in the Coachella Valley, Calif., to determine the quantity of water required to leach excess salts and boron from highly saline soils. This work is in cooperation with the California Agricultural Experiment Station, the Coachella Valley County Water District, and the Bureau of Reclamation.

In the San Luis Valley of Colorado where sub-irrigation is the common practice, a reclamatian experiment is in progress on coarse-textured, saline-alkali soils to determine the effects of pre-leaching, application of gypsum and calcium chloride as soil amendments, the use of soil conditioners, and the maintenance of high and low ground-water levels on crop growth. Preliminary results indicate that these high-sodium soils can be reclaimed by leaching alone and that favorable soil-moisture relations under the permeable soil conditions encountered are more easily maintained by sub-irrigation than by surface flooding. This study is in cooperation with the Colorado Agricultural Experiment Station, the Bureau of Reclamation, and the Western Soil and Water Management Section of the Soil and Water Conservation Research Branch.

Investigations of salinity and alkali conditions in the Emmett Valley, Idaho, have been completed recently. The saline, alkali, and drainage conditions in the area were characterized, and survey tests and methods which can be used for mapping saline and alkali conditions in this and other problem areas were evaluated.



Testing for alkali tolerance. The drums contain soil adjusted to increasing levels of exchangeable sodium: from left to right—4, 23, 37, 48, and 58 per cent. (Upper) Green beans, a very sodium-sensitive crop; (lower) table beets, a relatively sodium-tolerant crop.

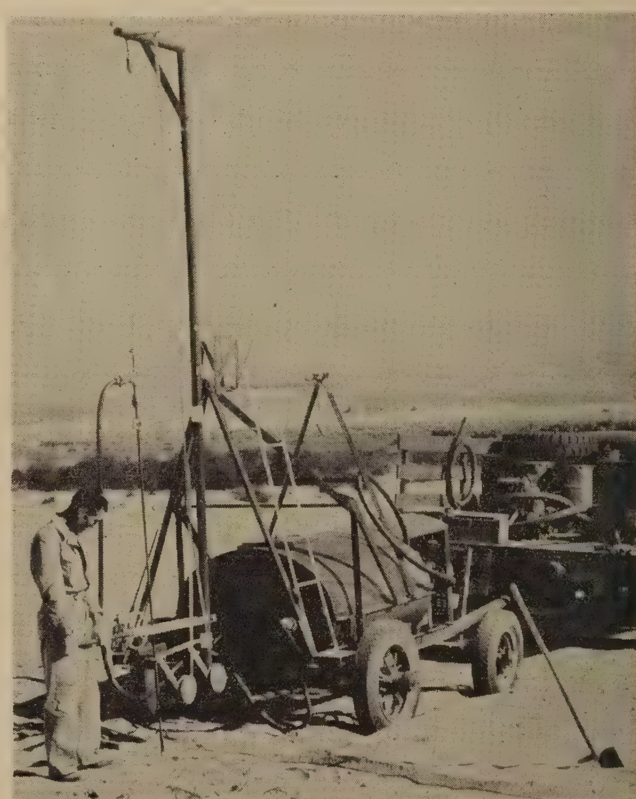
The Idaho Agricultural Experiment Station and the Division of Soil Survey cooperated in the survey.

Field tests on the Owyhee Project, Oreg., were undertaken with the cooperation of the Oregon Agricultural Experiment Station, the Soil Conservation Service, the Bureau of Reclamation and the Western Soil and Water Management Section. The objectives were to investigate the reason for low infiltration rates, and to study methods of improving alkali soil with manure and chemical amendments. The results, published in a bulletin of the Oregon station, indicated that application of manure plus gypsum, manure plus lime, manure, and gypsum, in that order, were most beneficial in increasing the soil infiltration rate.

If the research of today is to become the science which serves the agriculture of tomorrow, there must be effective means of intercommunication between research agencies and those that are engaged in field programs concerned with the conservation of soil and water and the production of agricultural crops. The Salinity Laboratory provides for the dissemination of results of its research through a system of state collaborators, by means of conferences with personnel of other agencies, through the publications issued by the Laboratory, and, more recently, by the appointment of field liaison representatives who serve as coordinators between the Soil Conservation Service and the Agricultural Research Service.

Effective cooperative relations have been maintained with the agricultural experiment stations of the Western States and Hawaii through official collaborators from each station, who serve as a connecting link between the staffs of the experiment stations and the Laboratory. They meet annually with the Laboratory staff to coordinate the experimental work, to review the research programs, and to make recommendations regarding future investigations.

The appointment of five field research liaison representatives and a national liaison officer, who are responsible to the Soil Conservation Service and the Soil and Water Conservation Research Branch of the Agricultural Research Service, is another step designed to improve the



Jetting rig for the installation of inexpensive observation wells (piezometers) used to determine fluctuations in groundwater levels and to log subsurface materials. Equipment developed by the cooperators on drainage investigations in the Coachella Valley, Calif.: University of California, Bureau of Reclamation, Coachella Valley County Water District, and the Salinity Laboratory.

Leaching operations in the Coachella Valley, Calif., showing contour borders This is a saline-alkali soil which will require leaching and the application of gypsum for reclamation.

transmission of research needs to research agencies and research results to those who are conducting action programs in conservation of soil and water and the improvement of agriculture. These liaison officers have the responsibility of keeping informed of the operating procedures of the Soil Conservation Service, of assisting both services in determining research priorities and the development of programs, and in channeling research information operating personnel.

The publications of the Salinity Laboratory provide an important means of making the results of its research available to cooperating agencies, professional agricultural workers, and those of the general public who are concerned with salinity problems. The Laboratory has published 185 papers and bulletins.

Included among these is Agriculture Handbook No. 60, entitled "Diagnosis and Improvement of Saline and Alkali Soils," which was issued in February of this year. It includes information on the origin and nature of saline and alkali soils, the principles involved in the determination of the properties of such soils, and the procedures to be followed in their improvement and management. Plant response to saline and alkali conditions is discussed, and lists showing the relative salt tolerances of crops are included. It also contains a chapter on the quality of irrigation water and the effect of various waters on soil conditions. Interest in the handbook is indicated by a worldwide demand and it appears that it may serve as an effective means of bringing the results of research at the Salinity Laboratory into practical use.

Family of Winners

By JOHN H. GIBSON

ORVAL LONG and his family make their living on a gently rolling farm in the Grundy Shelby area in Harrison County, Mo. They are in the Harrison County Soil District, and they have made an enviable record.

Let's look at a few of this family's accomplishments. In 1948, Orval was selected by the district board of supervisors as one of the outstanding conservation farmers in the Harrison County Soil District. He received a cash award from the Goodyear Tire and Rubber Company. In 1950, Larry, oldest son and then a 16-year-old FFA boy, won first place in the North Missouri contour plowing match, thus becoming eligible to compete in the national event whose ranks are usually filled with veteran competitors. Larry made up for his lack of experience by his youth and determination and took second place in his specialty of contour plowing. In 1950, 1951 and 1952, Orval won membership in the local 100-bushel corn club by producing more than 100 bushels of corn per acre on a five-acre field. In 1953, Gary, the second son, took his place in this contest by producing 116 bushels per acre. In the fall of 1952, four children of this family were stricken with infantile paralysis. To Jackie, the youngest boy, it was fatal. The others made satisfactory recovery, and Larry, although on crutches, is now an honor student at Northeast Missouri State College and Gary is winning honors in the family tradition.

Gary's most recent achievement was the winning of a brand new Ford tractor in the Missouri FFA Tractor Operators' Contest. This match was designed to assist dealers and Vo-Ag Teachers by instructing farm boys in: (1) safety, (2) daily and periodic maintenance of tractor

(Continued on Page 90)

Note:—The author is soil conservationist, Soil Conservation Service, Springfield, Mo.

A mountain stream rushing down to the valleys of Utah.

Books in Running Brooks

Each stream measures the way man has lived with nature and gives warning while the landscape may yet be saved from abuse.

By WILLIAM A. BREYFOGLE

ON A DAY to be spent out of doors, a brook makes a good companion and a fascinating study. Brooks have been friends and associates of men as long as men have been on earth, and not only of men but of all living things. They are living things themselves, if birth and growth, change and vital function can make them so.

When all the laws that govern the working of physical matter have been explored, when rainfall, topography, climate and vegetation have been thoroughly discussed, something about a brook is still unexplained. Dissect a bird in utmost detail and you have not accounted for its song. The brook has a song, too, to make good its claim to be something more than just an intricate mechanism. Machines may whir, but they do not sing.

Note.—This article is reprinted by special permission of the Editor from the April 1954 issue of *Natural History*.

A brook is running water in its earliest youth, just after it breaks from the earth. It is worth a scramble over rough ground and through tangled undergrowth to come at last to the pool, no bigger than a water pail, constantly astir with an impulse from the darkness beneath. Far away though it is, the mouth of the Mississippi or the St. Lawrence is implicit in the place. The stream flowing out of the pool is on its way to New Orleans or Tadoussac.

An inspection of its brooks will tell you much about the general health of a region.

They are the little veins in the earth's great circulatory system. In health, they carry nutrients for a host of plants and animals. In illness, their pollution can warn us that a landscape is being ruined while there is yet time to save it.

A steady current and clear water mean that the woodlands have escaped reckless cutting and that the topsoil formed over thousands of years has stayed in place, instead of being swept away like a spendthrift's money. The fishing will be better in this brook, animal and

plant life in the woods will be more abundant, and the farms near by will be more prosperous, better places to live. There is no sadder sight in nature, and none more alarming, than a watercourse shrunk to the merest trickle in the heat of summer, swollen to a muddy torrent by the surface runoff of spring. More ominously than any statistics, it proclaims a culture in decline.

One thing to be learned while loitering along a brook is that natural beauty is a matter of the first importance, not only to the artist but to the economist. A swamp with a profusion of pitcher plants and lady's-slippers, perhaps the rare little ram's-head; or a patch of hardwood cover where a fox still rolls in the sun in front of his earth—these are, quite literally, like money in the bank. They mean that a district has been settled and cultivated without being despoiled, that the people here are living within their income and leaving the truest kind of capital untouched. There is nothing sentimental about an interest in the preservation of wild flowers. They are of just as vital concern to a banker as to a botanist.

The brook exists not as a thing in itself but as a part of a highly complex system of symbiosis, which means "living together." In animate nature, there is no such thing as isolationism. Each individual life touches many others and at more than one point. The function of the brook is to carry off rainfall. But, besides that, it provides a home for trout and caddis worms and watercress. It gives drink to the farmer's cattle in a pasture below the woods, and it turns the miller's wheel, just as it once filled the beaver's pond. What must always be remembered is that the system of which the brook is a voice and a symbol is in such close and delicate balance that no part of it may be rudely changed without disrupting the whole. The trout in its pool and the wild orchid in the woods are at the mercy of the lumberman, or of the farmer, or the careless hunter who does not put out his fire. When the trout and the orchid disappear, the beauty and fertility of a whole district go with them.

Travelers along the modern highway that was once the old National Road, from Cumberland over the mountains to Wheeling and on across Ohio, sometimes smile at the disproportionate size of stone bridges built nearly a century and a half ago. But the bridges were not too big when they were put there; it is the streams that have shrunk as the great woods were cut down without any foresight in the scramble for land. Those old bridges are nothing to smile at.

It is a mistake to make a distinction between the world of nature and the world of mankind. Man's world is only a part of the larger one, and its vital processes are not suspended because he has settled to agriculture and built cities. On the contrary, his well-being still depends upon those processes, whether he lives along a country road or in an apartment-hotel in New York. He may try to shrug off what is happening on the hillsides or the riversides, but both are nearer than he thinks. The brooks still run for him, though he may seldom catch even a glimpse of them now.

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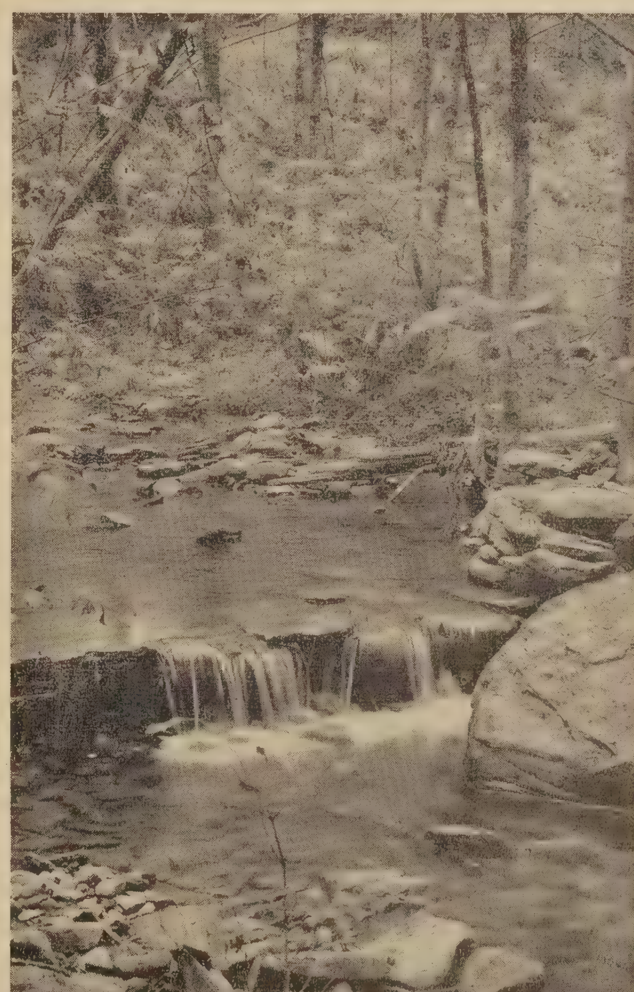


West Trout Brook in New York.

Bee Pastures in the Conservation Plan

By ARTHUR B. BEAUMONT

Staghorn sumac, a desirable source of pollen and nectar; adapted to dry, stony soils.

FARM conservation plans have been prepared for many specialty farmer groups including dairy farmers, market gardeners, and orchardists. But little special attention has on the whole been given an important group of food producers, the beekeepers. There are some 600,000 of them in the United States. In recent years SCS technicians in Worcester County, Mass., have been quietly developing techniques and procedures in this important field. They have met with considerable success in working with local beekeepers. This article constitutes a progress report.

The major value of bees to society is not in the honey and wax they produce, important as these products are, but in the pollination of fruit, vegetable, clover and other flowers. It has been shown repeatedly that wild insects cannot be depended on to give adequate cross pollination required by certain flowers. Where there are no domesticated honeybees, pollination is generally haphazard and fruit or seed set is meager.

Bees, like other living things, must eat. The food of bees is pollen and honey which comes from nectar obtained from blossoms, and they must have these substances throughout their working season. Since each plant species or variety has a definite though short blooming period, it is necessary to provide a variety of bee pasture plants which blossom at different times within the season. Honeybees, just as truly as cattle—their counterparts among the four-footed animals—are foragers, and bees, like beeves, must have a continuous supply of food. The honeybee is the only domesticated animal serving man that gathers its own food in the summer and stores a surplus for winter use. This it will do in amounts sufficient for its own needs, and also produce a surplus for man if he will provide adequate pasture.

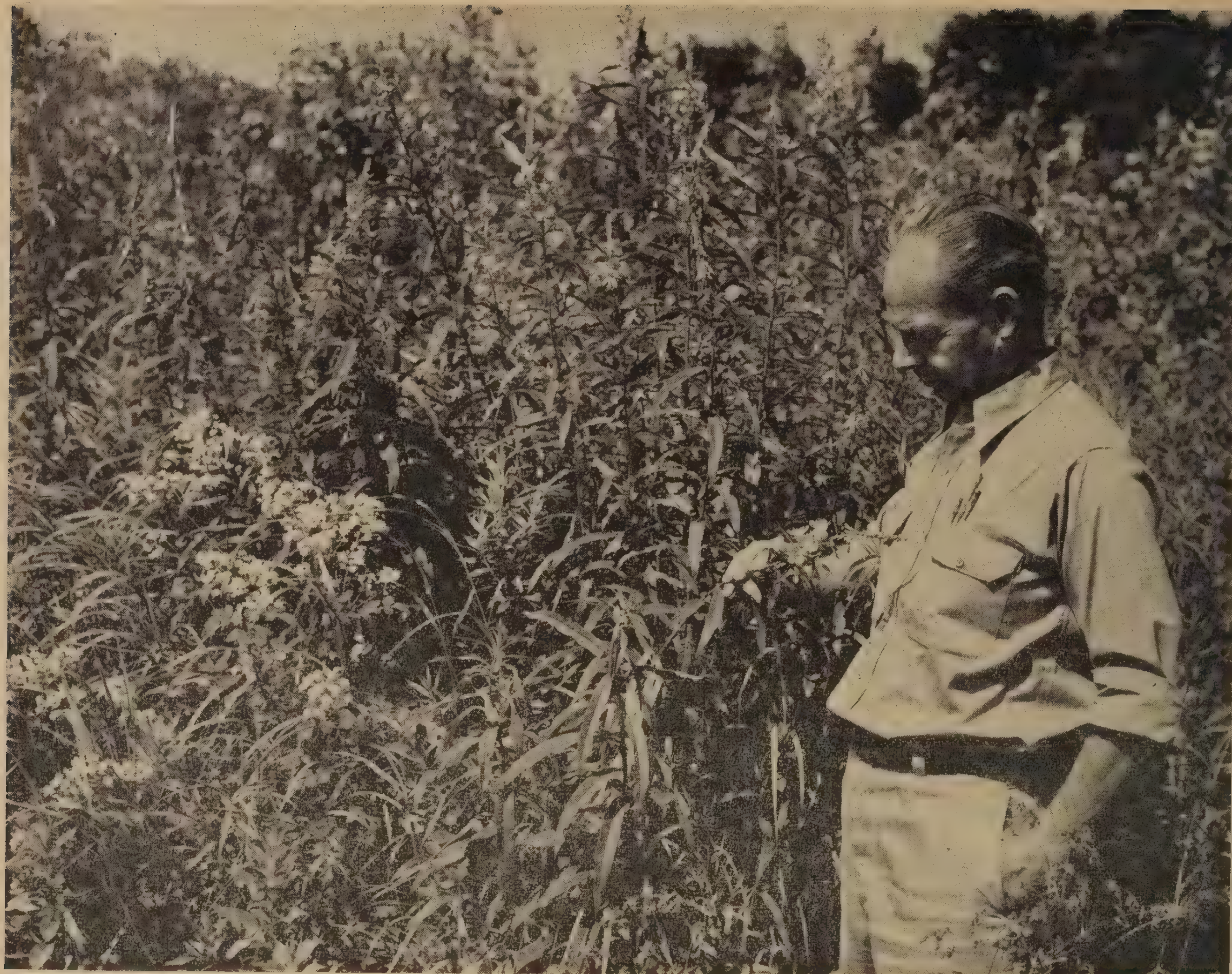
Note.—The author is state conservationist, Soil Conservation Service, Amherst, Mass.

Mr. and Mrs. Ralph Easterbrook and son Arthur, of Dudley, Mass., examine sweetclover sown on their farm for bee pasture. Bee pasture plan No. 1 was prepared for this farm. Easterbrook is a cooperator and supervisor of the Southern Worcester Soil Conservation District.

The national soil conservation program involves the use of a wide range of soil-conserving plants, among which are many nectar- and pollen-bearing species which are dependent on domesticated honeybees for seed and fruit production. The different sections of our country vary in the manner and the degree in which local programs are affected by the activities of bees. For example, sections in which clover is grown primarily as a seed crop must have a numerous bee population, but those in which clover is grown for forage only need no bees so far as that crop is concerned.

The bee pasture planner must know the bee-food value of plants and when and how long they are in blossom. He must know what plants are especially good producers of pollen and which are good sources of nectar. The planner must also know the soil and climatic requirements of these plants. The development of a soil conservation program for the beekeeper offers an excellent opportunity for promoting proper land use. An important element in this kind of planning is the means it affords of utilization of odd areas unfit for other kinds of agriculture. Many of the shrubs and trees valuable for bee pasture are well adapted to land classes VII and VIII.

Planning for bee pasture offers excellent opportunities for cooperation among neighborhood farmer groups. Since bees are thought to be able to forage economically within a radius of one-half to one mile, the beekeeper may well



Roscoe Johnson looks at "fireweed" (*Epilobium angustifolium*), a bee pasture plant in bloom in July. It is especially adapted to moist situations.

enter into some agreement with his neighbor to plant bee pasture plants. The beekeeper might profitably finance the planting of suitable pollen- and nectar-bearing plants on nearby farms.

The development of the technique of planning for bee pasture came naturally to Roscoe E. Johnson, soil conservation technician in the Northwestern Worcester County Soil Conservation District in Massachusetts. Johnson not only knows soil conservation, he also knows bees. He was a beekeeper for years. In fact, it was through his experience in keeping bees that he discovered the need for developing bee pasturage. He observed that a few colonies of bees could generally find enough food within economical flying distance but 10 or more colonies could not do so.

In assisting a beekeeper to plan adequate bee pasturage, the first thing the technician must do is to scout the farm and the vicinity for suitable pollen and nectar plants already available. These plants, and their quantities are listed in chronological order of blossoming. With this information at hand, the technician is then able to recommend species to fill in gaps. This is where technical knowledge of plants and their site requirements comes in. An example of how this procedure applies can be cited. An apple-grower who keeps bees primarily for insuring pollination purposes requested assistance. A careful appraisal of the situation revealed that a planting of sweetclover was all that was needed to complete the pasturage. The planting was made and is shown in one of this article's illustrations.

Herewith is a checklist of bee pasture plants suitable for Massachusetts conditions, which Roscoe Johnson has arranged in approximate chronological order of blossoming from April to November. Similar lists could be prepared for other states or areas. Those for the South and West would differ considerably from those of the Northeast.

1. Crocus
2. Skunkcabbage
3. Alder
4. Pussywillow
5. Poplar
6. Elm
7. Red maple
8. Spicebush
9. Cassandra
10. Weeping willow
11. Boxelder
12. Norway maple
13. Sugar maple
14. Cowslips
15. Gill-over-the-ground
16. Shad
17. Dandelion
18. Black birch
19. Pin cherry
20. Apples
21. Sassafras
22. Blueberries
23. Chokecherry
24. Tatarian honeysuckle
25. Red pine
26. Wild black cherry
27. Rugosa rose
28. Blackberry
29. Raspberry
30. Black locust
31. Orange hawkweed
32. White Dutch clover
33. Ladino clover
34. Alsike clover
35. Yellow sweetclover
36. Grapes
37. Multiflora rose
38. Alfalfa
39. Sumacs
40. Dogwoods
41. Dogbane
42. Winterberry
43. Milkweed
44. Fireweed
45. Sweet pepperbush
46. Purple loosestrife
47. Hollyhock
48. Cattails

(Continued on Page 96)

Everlasting sweetpea, a good source of nectar during August; long lived.

Load by Load, They Put It Back!

Up-and-down rows, winter storms, gouged away the topsoil. This is a fair sample of the 35-acre field mentioned in this article.

By J. M. RABDAU

IN what is believed to have been the first field demonstration of its kind, 50 FFA and 25 4-H youngsters, and about a dozen GIs who are in agricultural training in Latah County, Idaho dramatized the heavy losses that farmers and ranchers suffer when uncontrolled runoff sweeps over their sloping fields, cuts channels and carries away many tons of topsoil.

These young volunteers bent to their task at the business ends of shovels and at the handles of wheelbarrows, and put the topsoil, *at the rate of 93 tons per acre,* back where it had been gouged out by last winter's storms.

Four hundred farmers, and others deeply interested in soil and water conservation, saw the boys do the job and learned what erosion means. Through newspapers, radio and TV, many other farmers, and almost everybody else in the Latah district and adjacent areas, came to realize that what appears to be slight washing quickly adds up to terrific soil and crop losses per acre. The domonstration reached right down into their pocketbooks.

The storm damage was done in 4 months last winter at the Snow Brothers farm, south of Moscow, where the demonstration was held. It extended across the slopes of a 35-acre field. The restoration was made on a tenth of an acre, where the slopes ran about 25 percent. The damage occurred because the operators had worked the soil too finely, and had seeded it in drill rows running up and down the slope, rather than on contour and across the slope, the way the Snows generally handle their cropland.

In the demonstration, 114 wheelbarrow-loads of topsoil were recovered from where it had been deposited at the base of the slope. It was shoveled into the barrows, pushed up the hill on planked runways, and put back in place, with

Note.—The author is work unit conservationist, in the Soil Conservation Service unit which assists Latah (Idaho) Soil Conservation District.

careful compaction, thus restoring the face of the land to a condition under which normal operating and production methods can be resumed without interruption.

This much topsoil meant moving 29,416 pounds of earth, a net of 18,611 pounds of soil after the 30 percent moisture content had been deducted. These are banker-exact figures. The agricultural representative of a Moscow bank, and the manager of another Moscow bank, did the weighing at tested scales when the boys moved up the grade with their loads and when they came back with the empty barrows.

Twenty-five man-hours of work were required in the restoration operation. This indicates that a total of 1,093 man-days work (3½ man-years) would be needed to do a like job over the entire 35 acres. At $10 per day, it would represent a cost of $10,900.

On top of that, there is another angle in the loss that erosion causes. The technicians made a test for nitrogen content and found 1.435 pounds in the one-tenth acre. Since 2 pounds of nitrogen are required to produce a bushel of wheat, according to calculations by Roy Harder, University of Idaho agronomy department, the

Men at work! Displaced topsoil was shoveled up at the base of the slope, carefully weighed, toted back up the slope in wheelbarrows, and dumped into the gaping holes.

loss of nitrogen (1.435 times 18,611, the net loss of soil) gives a practical idea of the total loss per acre when productive farmland is eroded. Orval "Red" Snow, one of the farm owners, summed up that situation in this comment: "It's what you get when you don't farm on the contour."

The idea for a soil loss and recovery demonstration was hatched out by John T. Nicholas, a member of the Soil Conservation Service field unit that assists the Latah Soil Conservation

Some of the channels were 14 inches wide and more than a foot deep. John T. Nicholas here measures some of the damage.

Final step was to compact the topsoil. In another year it should again be productive.

District. He organized his associates in the unit —Lawrence Sorensen, Manning Onstott and Harold Fulgenhauer—in a committee, of which he was chairman. They enlisted the sponsorship of the district supervisors, who helped gain the cooperation of newspapers, radio and TV, the Moscow Chamber of Commerce, County Agent Elbert McProud and the Extension Service, the agronomy department of the University of Idaho, and others. Included were farm machinery and supply dealers, lumbermen, millmen and builders, grain growers and commission men, and other businessmen, who supplied tools, equipment, materials needed for the work, prizes, and refreshments for workers and spectators. The Moscow high school band played lively tunes that kept the young workers on the move, and the spectators on their toes. Boy Scouts aided in parking cars.

Chapters of the Moscow, Troy and Genesee Future Farmers of America, the Latah County 4-H clubs, and the GI Agricultural Training Classes at Troy and Moscow provided the 90 volunteer workers.

All in all, it was another bang-up achievement for Johnny Nicholas, and spoke well for the teamwork of work unit and district. Nicholas is a veteran. He started farming in Nebraska, got caught up in the dust bowl debacle, came west to the land utilization project, and 6 years ago, transferred to Moscow. We all hope that he stays a long while. I still marvel over how he gets up so many good sound ideas and carries them through. In meeting people in all walks of life, and in getting them stirred up to action, I've never seen his equal.

BOOKS FROM RUNNING BROOKS

(Continued from Page 83)

But it is a pity if he does not. For, quite apart from their importance in the scheme of things, there is nothing more beautiful than a brook in being. Much that it has to say may be apprehended rather than understood—the pattern of water in sunny shallows and the way willows lean out over a pool, a muskrat making his purposeful way upstream, a kingfisher diving. Where the stream flows through woods, crows have an officious way of policing its course, crying aloud to all whom it may concern that something is moving down there. On a quiet stretch, the water striders make nothing of what is no miracle to them. Much higher than the noisy crows, a hawk soars, ready to plummet earthward when his prey slips down to drink. The swirl in the water just ahead may be a mink at his fishing.

A brook is a busy place, not only in its own primary work but in the variety of life it supports or attracts. And its beauty is informed with all this vitality, which is perhaps what gives it universal appeal. It is very much a part of the world that all living things inhabit, and a most sensitive indicator of the state of health of its own part of that world.

It used to be said that true intellectual curiosity could begin anywhere and find one subject leading into another until the whole realm of knowledge and understanding had been included. Certainly, given leisure to explore all its aspects, this is true of a brook, and it may be only another way of saying that the world is one world, not divided into compartments but to be understood, if at all, as a whole. The study may be as profitable as we wish to make it and as delightful as an afternoon along a brook's course. Surely it is true that there is hope for every people so long as they have not let their brooks run dry.

FAMILY OF WINNERS

(Continued from Page 81)

and plow, (3) field adjustments, (4) operation of equipment and plowing skill.

Gary first had experience in plowing contests when he competed and won first place in the junior division of the North Missouri plowing match in 1950, and naturally he assisted his big brother Larry in winning second place in the National Plowing Match. It appears that this FFA contest was made to order for Gary. After being selected by his own FFA chapter to represent them, Gary battled his way through the county, district and state contests. It has been reported that Gary spent some 70 hours in practicing plowing alone and countless more hours studying and reviewing the operator's manual for tractor and plow.

The winner of first place over six of the outstanding FFA members, is a great accomplishment, but it fits the pattern of living and farming being done by this family.

Harlin spent an afternoon each week explaining soils—how they are formed, how they should be protected. The Scouts studied topsoil, learned how it develops from subsoil, grading into bedrock, the parent material of all soils.

On a field trip to a nearby farm, the Scouts saw examples of soil conservation practices. They were shown how good ground cover, such as trees, pasture, hay, and forage crops, protects the soil from the rain.

Two bottles, one containing muddy water from an unprotected area, and the other containing clear water from a well-managed forest were kept at the conservation den as a reminder of what happens when soil does not have a proper protective cover.

At the end of each week a short test was given to see what had been learned. The Coosa River Newsprint Company awarded a saw to the boy who made the highest score.

Scout Executive DeWitt Thompson said this was one of the biggest and most successful camps that Choccolocco Council has had.

Reverse Irrigation

By HYLON C. SMITH and WILLIAM R. RATLEDGE

MAY was a dry month. June followed with an even greater promise of hot, dry weather. John Annett of Staytonville, Del., looked at his drying fields and made a decision. He asked the Soil Conservation technicians from the two districts serving his farms for assistance in establishing an irrigation system.

This is a familiar beginning to many stories on how a farmer received help through his local soil conservation district. If followed to its completion, the story would tell you how the farmer saved many acres of string beans, thanks to his new irrigation system, supplied by water from three dugout ponds built in just the nick of time. All of this is true, but it is not the story we want to tell.

John Annett has a farm in Sussex County, Del., where the soils generally are quite sandy. The soils range from very droughty to very wet. Fields where irrigation may be needed during one week may require drainage the next. In some fields irrigation is a must on sandy ridges, and a must-not on flats and pockets where the soils are poorly drained. These problems were discussed by Annett and the technicians, and a plan was made to provide much of the necessary drainage in conjunction with the irrigation system. It seemed a little odd to see a dragline at work building ditches in a field while the irrigation system was pumping water from a newly dug pond in the same field. Neighbors for miles around envied the irrigation system as crops parched during late June; they watched the construction work and questioned the wisdom of ditches while crops burned up.

What makes this a different story? Reverse irrigation! The first 4 days of July brought some nice showers to supplement the irrigation, but July fifth brought a young flood. More than 3 inches of rain fell in the space of a few hours on the Annett farm. The newly dug drainage ditches filled and carried water to the pond. After the rain, many small ponds were scattered throughout the fields where drainage ditches were not practical and tile drainage was impossible. Crops were threatened with drowning and scalding, and some with weed damage, if the water could not be removed. John Annett was equal to the occasion. He reasoned that if his irrigation system would pump water out of the ditches it could also pump it back in. The portable pump and pipes were quickly put to work and a surface tile line soon moved the water from the ponded areas to the newly dug ditches. John Annett is now able to cultivate his crops while many of his neighbors are still waiting for the ponds to dry up.

John Annett, wth rare ingenuity, saved a crop from drowning by performing a drainage operation with an irrigation system.

Note.—The authors are respectively, supervisor, Sussex County Soil Conservation District and work unit conservationist, Soil Conservation Service, Georgetown, Del.

Curved Fields vs. Square Ones

There is no substitute for personal experience. This is the story of one farm and one man. Together, they discovered the methods and rewards of conservation.

By VILLARD W. McLAUGHLIN

AS A BOY I worked on the farm I am now operating, near Dyer Brook, Maine. We had square fields, and the points of the compass were used as guides. We learned everything we could about raising good crops of potatoes. The farm has 86 acres of cropland, 14 acres of hay land, and 33 acres of woods. The woodlot is on a very steep slope just above the fields. Very little of the cropland slopes more than 4 to 10 percent. Every spring, and often in the summer and fall, water would run from the steep slope and over all the fields north, west, and south, taking soil and fertility with it. My father often remarked that some day the whole farm would be down in the brook and he didn't know what to do about it. He tried everything he thought might help but he could not stop the water damage. It used to be a good farm but crops were getting poorer.

I took the farm over in 1939 and began farming in strips on the contour. That same year my neighbor across the road, who always had had similar trouble with water washing his fields, made an effort to stop it. The next spring I went over his fields and found that they had not washed. He told me that through the Extension Service he had been helped by some Soil Conservation Service technicians who were located in Presque Isle on a demonstration project there. I asked these technicians to look over my farm and advise me what to do.

Note.—The author was active in the organization of the Southern Aroostook Soil Conservation District. He has served continuously as secretary-treasurer from the beginning, and also served as president of the Maine Association of Soil Conservation District Supervisors. His conservation farm plan was in effect before the district was organized in 1941.

District Finds Our Magazine A Good Investment

FROM De Smet, S. Dak., comes a report which ought to be helpful to many soil conservation districts searching for a way to plant vigorous new ideas among their cooperating farmers. Harold C. Fritzel, the treasurer of the Kingsbury County Soil Conservation District, joins with Arthur Brose, chairman, in writing:

"We have just recently sent an order to the Superintendent of Documents for 79 one-year subscriptions to SOIL CONSERVATION, the official organ of your Service.

"Our total subscriptions, to date, amount to 655. This is the sixth consecutive year we have furnished our new cooperators subscriptions to your magazine.

"I would like to add that our board of supervisors believes it is a means of attaining and retaining good cooperative relations with our cooperators, as well as informing and alerting them to the many possibilities in the field of soil conservation.

"The matter of subscriptions was brought up at our July meeting, moved, seconded and unanimously approved within 30 seconds."

The plan which they worked out surely looked funny to me. The new map did not look like the farm at all. There were to be no more of the square fields and straight rows with which I was so familiar. But I realized that the way we had been farming, even though we had been following all the latest recommendations for growing potatoes, we were not going to get the crops I would need if I were to keep on farming. I decided that this new plan might be the answer. So I told the technicians to lay it out. I would dig ditches and follow their recommendations on rotations and general management.

That summer we dug 4,300 feet of outlets, 6,200 feet of diversion ditches, and laid out the whole farm in contour strips. Later on, I dug a pond, took some ledge outcrops from the fields, and did some improvement in the woods. As time went on, minor changes were made in one or two of the ditches.

There are still a few trouble spots in the hay land which I hope to find a way to take care of, perhaps putting some of the land in condition for potatoes. In dry years this field yields the best of any part of the farm, but it cannot be depended on every year.

In 1940, my farm was rated as the lowest producing one in the area—an average of 90 barrels per acre per year. I have no record of yields for the next 3 or 4 years, but I know they increased. During the last 10 years I have had about 160 barrels per acre consistently. Hay and grain crops are also better. I believe that these better yields are a result of keeping the soil and fertility where they belong; more of the water is being stored in the ground for the crops since I began using strips. I know of farms planted up and down the slopes which yield much better than mine when the rainfall is above average, but in dry years their yields are much lower.

During the war I did not increase my potato acreage above that provided for in my farm plan. I felt that if I did I would undo what had already been accomplished in building up the farm. I saved what was left of my farm, I am getting consistently good yields, and I have the satisfaction of knowing that the farm will be in much better condition for my son to operate than it was when I took it over. This is why I believe in conservation farming.

"Dead" Soil Comes To Life

By W. R. ELDER

SEVEN hundred and eighty pounds of lint cotton per acre!

That sounds like an irrigated crop. But Clinton Harbers made the yield in 1953 on a flat Blackland bench along the Colorado River northeast of La Grange, Tex. The rainfall was no more than normal. As Harbers tells it, the picture of a streamlined cotton factory comes to mind.

When Harbers returned from war, he bought the 100-acre farm of his boyhood. Land, machinery, seed and fertilizer put him $34,000 in debt.

The farm in 1946 was far from Harbers' dream of what it ought to be. The heavy clay soil was in bad condition. Here and there the land was poorly drained. Cotton yield was 125 pounds of lint per acre. The previous owner had made about $500 net the year before. There were innumerable problems, not the least being that $34,000 debt.

Harbers needed help in laying out drainage ditches on the farm, and he got it from the Soil Conservation Service. A soil survey revealed some of his major problems. This topsoil, though very deep, was dead. It was low in organic matter, had a bad plow pan, and was deficient in air space and fertility. Harbers saw he was not altogether correct in his belief that drainage and fertilizer out of a sack would make high yields.

As Harbers developed his coordinated conservation plan as a cooperator with the Bastrop-Fayette Soil Conservation District, he began to visualize the "assembly lines" needed to supply the water, air, and fertility for the cotton. Since the soil supplies all of these to the plant, it would have to be changed from its poor condition, he realized.

Harbers drained the land and started growing legumes. To open up the soil far down, Harbers first tried *melilotus indica*, then dis-

Note.—The author is soil scientist, Soil Conservation Service, Temple, Tex.

carded it in favor of Hubam clover. Fall-planted Hubam, with 200 pounds of 16-20-0 fertilizer under it, on a fourth of the land each year, took care of the deep "opening up." This let the cotton roots go far down for water, air, and fertility. Harbers let the Hubam go to seed, and grew no cotton on the clover land in the same year.

Harbers put a winter cover crop on the other three-fourths of his land to protect the soil and add organic matter. He tried Austrian winter peas, and hairy vetch but presently began using Willamette vetch instead. Fertilized with 200 pounds of 16-20-0 each year, the Willamette produces a larger tonnage of organic material than Austrian winter peas or hairy vetch.

When all of the land was covered with legumes, the Harbers cotton factory began producing. With Hubam clover for organic matter down deep, and vetch for a yearly "shot in the arm" of fresh, rapidly decaying material, the soil was in condition to catch and store most of the rain that fell. There was plenty of air in the soil for the roots to breath. The legumes released fertility steadily during the summer to feed the growing cotton.

Because of his investment in legumes to keep the soil open and alive, Harbers couldn't afford to destroy its sponginess with ordinary plowing or bedding. So he used a chisel plow to keep the residue on the surface. On the plow frame he built fertilizer boxes and small-seed planters so that two rows of vetch could be planted and fertilized at the same time. With this tool he plows the land in the fall and, after a disk-type bedder throws up small beds, puts fertilizer down in two bands on the sides of the beds. The small-seed planter seeds the vetch above the fertilizer in the same operation.

In the spring Harbers undercuts the vetch on the beds with sweeps. Then a disk harrow, set straight, chops the vetch up. The disk bedder, reversed, clears the top of the bed of the vetch. Cotton then is planted on top of the undisturbed bed. Stands have always been good as the bed is firm and no moisture is lost in stirring. The vetch straw is moved back against the cotton as a mulch to save moisture and control weeds.

Insect control is early, and effective. At the two-leaf stage, a series of 9 sprays and dusts is begun and completed in 63 days. *The natural enemies of the destructive insects are allowed to come in and take over the control job. By the time bollworms arrive on other cotton fields, Harbers' cotton is at the gin.*

In 7 short years Harbers' cotton factory has come into full production. In 1947 the yield was 125 pounds of lint per acre; in 1948, 250 pounds; in 1949, 500 pounds. As the organic matter and moisture-storage capacity of his soil have increased, Harbers has had to increase the number of cotton plants to keep the size down so the stripper can be used to harvest the crop. He grows 80,000 plants per acre instead of the usual 40,000 plants.

Harbers' cotton factory is a reality now. Just as a factory assembly line brings materials to the right place at the right time, Harbers' soil gives the cotton what it needs at the right time. Hubam clover solved the soil's tightness with its deep roots. Vetch put the winter roof over the soil and picked up the fertilizer for summer delivery to the growing cotton. Limited tillage maintains the soil's porous structure which was built by the clover and vetch. Efficient control protects the cotton from insect damage. Once-over mechanized harvesting puts the finished product at the gin.

Is Harbers' cotton factory successful? The answer is clear. The $34,000 debt is paid and the $500 annual net income has grown to $15,000. The 125 pounds of lint per acre has increased to 780 pounds. The once dead wet soil, with less than 2 percent organic matter, is now a live, open, highly productive, well-drained soil with 3.2 percent organic matter.

BEE PASTURES

(Continued from Page 87)

49. Basswood
50. Meadowsweet
51. Hardhack
52. Buttonbush
53. Joe-pye-weed
54. Boneset
55. Snakeroot
56. Goldenrod
57. Asters
58. Baltonia
59. Witch-hazel

Planning bee pasturage as a part of the conservation plan has passed the experimental stage in Massachusetts. Beekeepers are intensely interested in it, and a number of conservation plans incorporating this phase of planning have been prepared.

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★ THIS MONTH ★

WELLINGTON BRINK
Editor

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THE WELLS CAME BACK.—J. D. Glenn of the Tirzah section of Lancaster County, S. C., made an interesting observation on the effect of soil conservation measures and a nearby farm pond on his well.

In the past, Glenn's well often reached the point where it was necessary for him to curtail its use. This was before he installed an electric pump and increased the consumption of water. Now, his well is producing without fail in spite of the present drought and the increased use of well water on his farm.

Glenn feels that the conservation measures that have been established around his well, together with the nearby farm pond, have improved his ground water.

E. B. Haney is another farmer who had trouble with well water in the past. Haney drilled three wells to supply his needs. Two years ago Haney built a pond near his dairy barn to furnish water for washing the barn. Last summer one well supplied his need. He states, "I feel that my wells have improved 100 percent since I built my pond."

Conservation measures tend to store the water where it falls.

—JOHN E. NISBET

FRONT COVER.—Serene and beautiful is winter in Idaho. The snow-blanketed mountains not only please the painter, the photographer and the skiier but also hold the key to an abundant harvest on irrigated farms below. As the snow melts and flows down this stream, the man with the long-handled shovel waits hopefully; much snow and slow thawing improve his prospects. This picture was made 17 miles north of Ketchum.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

A Flood Comes to South Weber

Disaster leads to a working partnership of many agencies and individuals, and a system is installed that promises to protect farms against the perils of both flood and drought.

By **THOMAS B. EVANS AND FRED RASMUSSEN**

LATE in December of 1951, and well into 1952, snows came frequently and heavily in most of the mountainous areas of Utah. The watershed draining into the Weber River was no exception. Measurements on snow courses in the mountains showed snow depths and water content high above normal. To top it off, spring came very late and when it did there was water everywhere!

Note: The authors are, respectively, work unit conservationist and engineering specialist, Soil Conservation Service, Salt Lake Area No. 2, Utah.

Orville Bybee, president, South Weber Diversion and Canal Company.

The Weber River, normally a swift-running mountain stream, became a raging torrent. Cascading down into the valley below, it inundated farmlands, swept away bridges, cut deep into riverbanks, lowered the river bottom as much as 3 feet in places, and washed out diversion structures.

To the small community of South Weber, with its 58 farms located near the mouth of the canyon, the flood presented an ominous situation. There had been 6 separate diversions and 7 separate ditches that supplied irrigation water to 1,066 acres. The river washed out all of the diversion structures and some of the ditches. The river bottom was left lower in places than it had been before. In other places, the channel had changed, placing the river a considerable distance away from the points of diversion. Getting water to fields depending on irrigation became a major problem.

It was to help in such circumstances that Congress passed the Emergency Flood Rehabilitation Law in 1952. Under this law the farmers requested assistance from the Soil Conservation Service. When the technicians made their initial investigation, it was determined that it would be a questionable move to restore the individual diversions to their original condition because they would again be susceptible to destruction by floods. The construction of permanent dams for each diversion across the existing channel of the river, and the relocation of the river channel to bring it near the intakes, would be much too costly.

It was proposed that a site to be selected for a main permanent-type diversion dam across the Weber River, and that the seven ditches be consolidated into one main canal down to the points of distribution. This objective was easier to propose than to attain.

First of all, it must be determined whether or not the seven separate ditch companies would

wish to consolidate into one company for those portions of their systems which were involved. At this point, Orville Bybee, a farmer in South Weber, assumed leadership and called a meeting of the ditch companies concerned. He also invited to the meeting P. H. Sorensen, Weber River water commissioner; Pratt Whitesides, Production and Marketing Administration chairman, and technicians of the Soil Conservation Service. At one of the later meetings, the organization of the new South Weber Diversion and Canal Company was authorized. Judge J. A. Howell was given the task of looking after the legal aspects. Orville Bybee was elected president and Cecil Byram was made secretary.

The company furnished rodmen to assist SCS engineers on preliminary surveys and when the surveys were completed SCS engineers worked out an estimate of the preliminary cost. The estimate came to $30,000, of which the company's share would be $10,000, with the government paying the difference out of Flood Rehabilitation funds—an arrangement which was accepted by the stockholders. From then on the wheels really began to grind—sometimes slowly, sometimes rapidly as an obstacle was surmounted. The more the project developed, the more people, companies, State and Federal agencies became involved, until it was truly a cooperative affair. For example, the company applied to the Utah Water and Power Board for financial assistance amounting to $10,000, a loan which was granted. The Utah state engineer and the Weber River Water Commissioner, Philip Sorensen, were called into the picture on determination of water rights, maximum flow in each canal, total amount to be diverted out of the Weber River, and on permission to change and consolidate the points of diversion. The U. S. Army controlled some land through which the canal would go, and this called for negotiation of a right-of-way. Additional easements for rights-of-way had to be obtained from three private individuals and a gravel company. Finally, the canal crossed the Roy City waterline, a 6-inch and a 12-inch waterline to military installations, a main line which supplied natural gas to Weber and Davis counties, two large oil lines which furnished crude oil to Salt Lake refineries, a main highway, and a county road. Fortunately, only one of the pipelines had to be relocated to permit construction of the canal. Between holding down a steady job, running his farm, negotiating easements, contacting the lawyer, the State engineer, and the Weber River water commissioner, arranging for rodmen and chainmen to help the engineers, and meeting with stockholders, Orville Bybee was a busy man!

Detailed engineering surveys were completed in the spring of 1953. The plans and specifications, as finally completed and approved by the company, called for the construction of one main diversion dam with 222 cubic yards of concrete, 8,600 feet of canal, 10 dividing structures and drops in main canal, 266 feet of 12-inch pipe for a siphon, and other miscellaneous items such as control gates, sluice gate and trash rack for dam, and culverts for road crossings.

The job was advertised for bids and on September 8, 1953 the contract was awarded to the low bidder among nine firms offering to do the work. Construction began in September 1953.

Favored by a dry season and moderate weather conditions the project was completed in December of the same year. The only unfortunate accident occurred when a dragline boom came in contact with an overhead high-voltage transmission line which resulted in fatal burns to a foreman.

As is to be expected on projects of such magnitude, a few changes from the original designs were necessary as the job progressed. These, however, proved to be minor and the job was completed substantially as envisioned by the planners. Final cost ran slightly over $28,000 for actual construction, and about $4,200 for engineering and supervision.

After the system had been in use for awhile during the early summer of 1954, the stockholders were convinced they had a good thing. Last spring was exceptionally dry and there was very little snow left in the mountains. This combination made the water in Weber River very low for the irrigating season. Orville Bybee says that, if the new diversion and canal had not been installed, he does not see how many of the companies could have gotten any water for irrigation into their ditches this year.

Farmers of the South Weber area now have a modern, sound diversion dam and canal system, which assures them of complete protection and

Construction of diversion dam, South Weber Diversion Canal Company.

control of their irrigation water supply in times of flood as well as in times of drought. The project stands as a monument to the cooperation of farmers, ditch companies, and many Federal, State, and local government and private agencies.

Grass and Water Keep Farm Safe

Lakes and ponds, beef and sod, are a successful combination on this 500-acre watershed.

By M. B. BRISSIE

DAVE CAMERON is water-minded. He farms in the Delphia section of York County, S. C. He doesn't figure to lose many drops of water or very much topsoil from his 650 acres. With the recent completion of a 15-acre lake, on which he got help through the Catawba Soil Conservation District, Dave now has 10 ponds and lakes on a 500-acre watershed. Thus, he has stock water, fish, and irrigation water, and protection against rainfall shortages such as have been frequent the last few years. Some 35 acres of his land are under water.

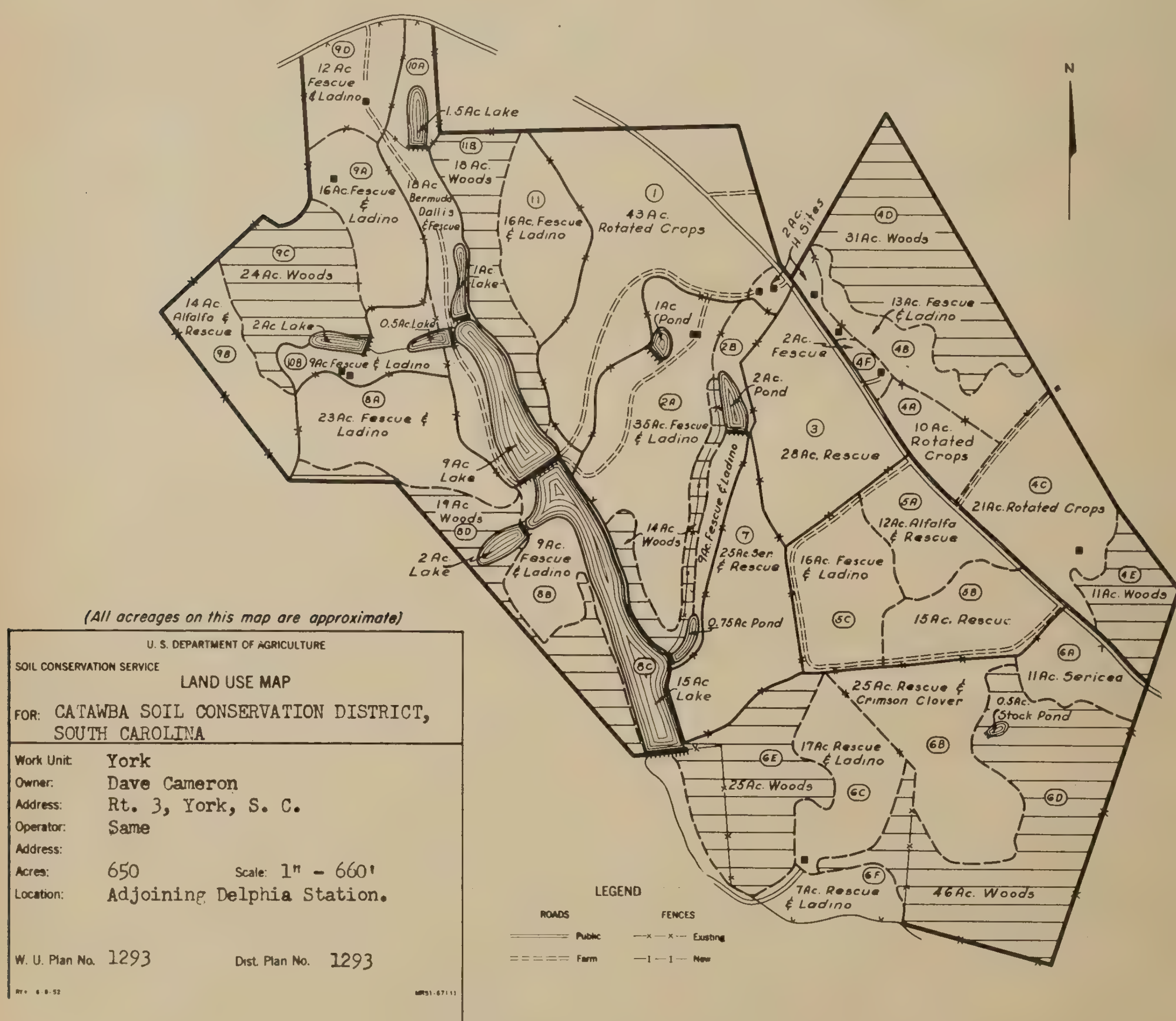
The drainage area feeding Dave Cameron's

Note.—The author is work unit conservationist, Soil Conservation Service, Rock Hill, N. C.

lakes is sodded with grass and clovers for the most part, allowing very little soil to leave his fields. Cultivated land in the area is terraced and under improved crop rotations. (According to research findings at the Soil Conservation Experiment Station at Watkinsville, Ga., good pasture sod is next to forest cover in preventing soil loss. Cultivated land (Class III) planted continuously in cotton lost 20 tons of soil per acre, but where a winter cover crop was used preceding cotton the loss was reduced to 9 tons per acre.)

Cameron really doesn't give the water that falls on his farm much chance to escape. If the sod and improved cropping practices fail to absorb the rainfall, then it "walks" down the slopes and is impounded in one of his series of ponds. At the first sign of drought in summer, this water is pumped back on the land to start the cycle again. "Whenever my fertilizer is washed into my ponds, I don't figure I lose it, as I will pump the water back on the land, and if I don't need to do that, then it will produce more fish," Cameron reasons.

Soil and water conservation is one of Cameron's pet concerns. He is one of the pioneer conservation farmers in York County, having been interested in the "doings" on the Fishing



Dave Cameron's guide to farming: his land use map.

Creek watershed in 1934-35, where the government then was furnishing technical assistance as well as labor and materials in getting large-scale conservation underway. Even though the Cameron farm was not in the Fishing Creek watershed, he invited technicians and engineers of the Soil Conservation Service to assist him in drawing up plans for work on his farm. He supplied all labor and materials, to get the job done.

During those years Cameron planted 125 to 150 acres of cotton on his farm and produced around ¾ to 1 bale per acre. By terracing and the use of soil-building rotations, he now produces, during an average year, from 1¼ to 1½ bales per acre. He attributes much of the increase to the use of annual lespedeza following small grain, and to its return to the soil. Cameron, during those early years, grew as high as 300 acres of annual lespedeza for seed.

Around 10 or 12 years ago Cameron began his two-armed system of farming—crops plus livestock. With the increase in numbers of beef cattle, he gradually shifted the use of his land from cultivated crops to hay and pasture crops. He now has 100 brood cows and is replacing all high grades with purebreds. Cameron believes that as fine cattle can be produced on grass in York County as can be grown in the grain country. Two things are necessary, he says, "First, you must have a good animal, and second, you must have grass with the proper elements in it, and this comes through putting the proper kinds and amounts of fertilizer on the grass." Cameron has his soil tested regularly with assistance from the county agent and his staff, and needed fertilizing elements are added scientifically.

"When you get the plants and fertilizer on the land, the only other things needed are water and sunshine," Cameron said. Here, again, he plays the game by his own rule book and does not use sprinkler irrigation but pumps water to his fields through open pipe and "floods" his fields. A 16-year-old boy is his irrigation personnel, moving the pipe to another portion of the field when the ground becomes soaked. For one section of his pasture he uses a small electric motor to pump water through underground mains. These mains are "tapped" at certain locations for irrigation of adjoining pasture areas. Cameron figures it costs him approximately $1.25 to $1.50 per day to operate his 5-horsepower electric pump. H. P. Lynn, of the Extension Service, assisted Cameron in working out his irrigation system.

Dave Cameron quietly goes about a job of soil and water conservation on the headwaters of a 500-acre watershed which will not only benefit him but also will help solve the problem of floods. District supervisors urge other landowners to follow the example of Dave Cameron in holding the water where it falls through applying sound soil and water conservation practices.

Tall Grass Defeats Prairie Dogs

By PHILIP F. ALLAN and BEN OSBORN

WHEN grass destroys prairie dogs, that's news! But that's just what happened on the Wichita Mountains Wildlife Refuge, Oklahoma. Good range grass crowded a prairie dog town out of existence.

Prairie dogs are not believed by mammalogists to be "native" to the tall grass country, often called True Prairie. That is, they invaded that kind of grassland from the Mixed Prairie or short grass country farther west. It seems likely that the peak of the spread of prairie dogs eastward occurred about 1880 following heavy grazing of the tall grass area. Indian grass, big bluestem, switchgrass, little bluestem, and the other plants were abundant there in the early days. But as they declined the shorter grasses and weeds came in. That was what the prairie dogs liked. They, like the other weeds, moved in on the mid and tall grass country.

Note.—The authors, both with the Soil Conservation Service, are, respectively, biologist for the northeast states, Ithaca, N. Y., and soil conservationist, Midland, Tex.

A perky prairie dog surveys the situation in his town.

In September 1946, we discovered that a prairie dog town near Grace Mountain in the Wichita Refuge had been abandoned during the summer. There was plenty of evidence to show that the dogs had not been gone long. Recent burrows and scratchings, pellets, and an area bare of vegetation showed that the town recently had been occupied. Then we noticed that the vegetation around the town gave the appearance of concentric rings. The plants in each ring appeared to be different. First, there were mat-like weeds around the bare area; next there were short grasses. Then came taller weeds and grasses. And finally there was an outer border of tall grasses—the kinds that originally covered the site. We counted seven of those rings, each of them 50 to 200 feet wide. In the rings of plants we found old abandoned prairie dog burrows. The farther away from the center, the older they seemed to be. Their relative age could be told by the kinds of plants that occurred on the mounds.

Plants follow a regular system in covering a bare area—such as a plowed field. First come

the short-lived annual weeds. These are followed by annual grasses and other annual weeds. Then those are replaced by perennial weeds and the longer-lived grasses. And finally—in grass country—come the deeper rooted and more permanent grasses. We found that system repeated on the prairie dog mounds as we went from the center of the town toward its edges.

We decided to make a careful study of the prairie dog town to see if we could find out what had become of its inhabitants. With the help of Ernest Greenwalt and Julian Howard—both of them Fish and Wildlife Service men—we were able to reconstruct the history of the town. We tackled it from two angles—the record of grazing of the area, and the study of the rings of plants.

The Grace Mountain prairie dog town had been in existence a long time. While other prairie dog towns on the Refuge were poisoned often, no poisoning had been done in this town since 1926. It was being preserved as an example of a natural prairie dog town because of its distance from the boundaries of the Refuge —and, hence, the unlikelihood of spread onto private lands around the Refuge.

What is now the Wichita Mountains Wildlife Refuge was, until 1935, a National Forest. Livestock were grazed upon it under permits. And much of it was considerably overgrazed. In 1946 more than 24,000 acres of the total 60,000 were still in poor to fair range condition. In 1937 all private grazing permits were terminated, and since that time the pasture in which the Grace Mountain dog town was found has been grazed only by bison, antelope, elk, and deer. The stocking rate is now about 40 acres per animal unit. The bison herd does not seem to use the site of that prairie dog town much, so it was only lightly grazed, except by the dogs, during the 9 year period that followed the removal of cattle. It is of interest to note, that, in spite of poisoning, the other dog towns on the Refuge have continued to spread while the unpoisoned Grace Mountain town dwindled.

When we started looking into what happened in the town itself we discovered that it once covered about 50 acres. At one end there remained a small community of about a dozen prairie dogs occupying about an acre, but the same rings of vegetation were to be seen there as at the abandoned part of the town a quarter mile away. Old burrows showed that the two centers had once been connected.

In the abandoned area we laid out two lines at right angles. One ran lengthwise and the other crosswise of the valley. This was done to see if differences in soils or moisture accounted for the rings of vegetation. Then we made records of the plants at 10 foot intervals, both by kind and abundance. We also noted prairie dog holes, ant beds, and any other things that might affect the vegetation.

Here is what we found. Each leg of the line showed the same belts of vegetation, so we agreed that it was not soil or moisture conditions that caused the rings. Where the prairie dogs had made their "last stand" 95 percent of the plants—which sparsely covered the denuded area—were short-lived, prostrate, annual weeds. The center was almost completely bare, but toward the edges more and more of those plants were found. Here we found claw marks, droppings, and signs of grazing by the prairie dogs. This area was 200 feet long and a hundred wide. Next came a 70- to 200-foot ring of prairie three-awn grass—an annual not much liked by prairie dogs nor by livestock. There were two distinct parts to this zone. First, we found plants of the year, and next, not only that year's growth but also dead plants of the previous year. Here the prairie dog mounds were covered with annual weeds.

The third belt had lots of prairie three-awn, but taller annual and perennial weeds were especially noticeable. The mounds here usually were covered with three-awn. Buffalograss, blue grama, poverty dropseed, tumble windmill grass—along with prairie three-awn—appeared in the next belt. And the mounds were covered with the same plants. Most of the mounds were indistinct here. Openings were filled in. It was obvious that the burrows hadn't been occupied for a few years.

Buffalograss and blue grama made up half of the cover of the next ring. Prairie three-awn was going out. The few old burrows of the prairie dogs were completely covered with plants typical of the rest of the belt. Ring num-

(Continued on page 113)

Fritton's barnyard stands in bold relief on the wind-swept horizon.

Stubble Mulching of Wheatland To Control Wind Erosion

By VIRGIL S. BECK

STUBBLE mulching of wheatland in wind erosion areas can provide the best assurance of producing a profitable crop and prevent soil blowing at the same time, according to Arthur Fritton, who owns and operates a 3,550-acre farm 11 miles northeast of Cheyenne Wells, Colo.

Stubble mulch tillage leaves practically all of the residues from the previous crop on the surface. These crop stubbles furnish protection against wind erosion, although the surface is broken enough to increase moisture penetration. The stubble also breaks up the raindrops and prevents crusting of the surface which results in a loss of water by runoff.

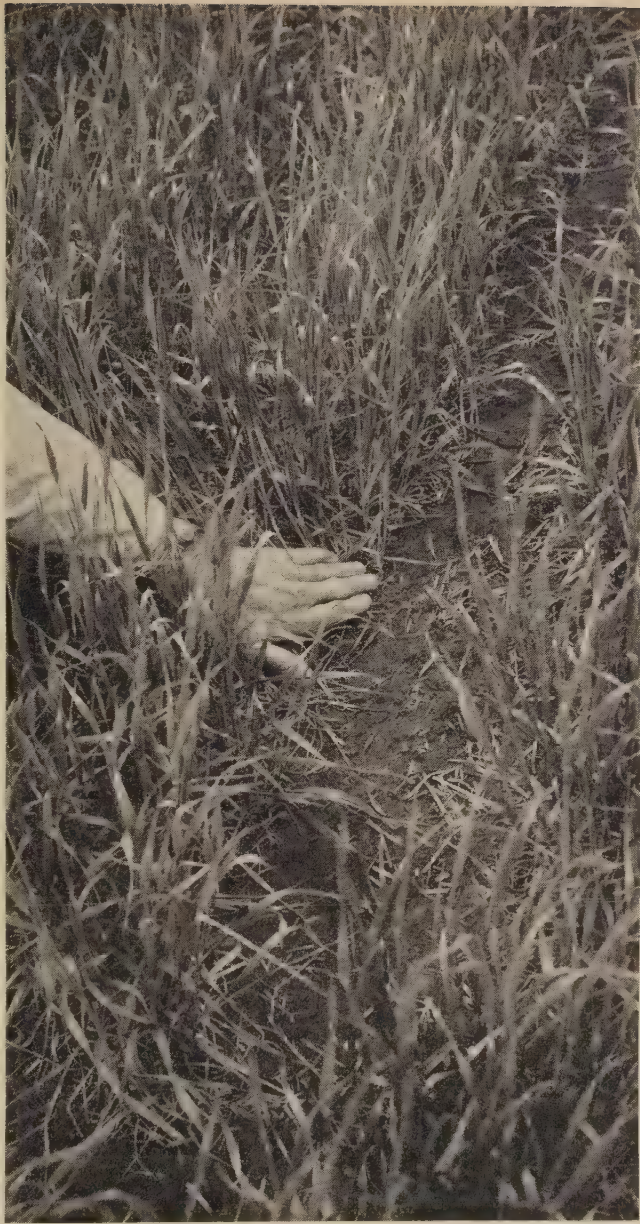
Fritton, who started stubble mulching last year, now has as fine a stand of wheat as can be found in Cheyenne County. If more rain comes within the next few weeks from my writing of this article, and there is no hail or insect damage, he expects to harvest between 15 to 20 bushels to the acre. While Fritton's wheat prospect is excellent, many other fields in this critical wind erosion area have been blown out and the crop has been lost. Although there have been several severe dust storms this year, soil blowing on Fritton's farm has been confined to a few small spots.

Dust storms are nothing new to Fritton. He was brought to this area as a small child in 1918 when his parents moved here from Nebraska. He has owned and operated the farm since 1929, and has a vivid recollection of the Dust Bowl of the Thirties.

"We have much more efficient machinery for farming now than we had a decade ago, and we also know a lot more about the techniques for controlling wind erosion," Fritton points out.

"However," he says, "a lot of the oldtime farmers in this part of the country have become careless during the wet years and are not following soil and water practices as they

Fritton (left) and Don Gillespie, SCS technician, appraise the wheat condition.



Closeup of residue from last year's wheat crop which still shows between the rows.

should. Too, a lot of farmers who have moved into this area since the old Dust Bowl days are not experienced in wind erosion control and don't know what to do. I don't believe soil blowing will be solved until farmers follow proper conservation methods. There should be someone living on each two or three sections of land so they can take immediate action if blowing starts."

Fritton has been cooperating with the Cheyenne County Soil Conservation District since it was organized. He is carrying out a complete soil and water conservation program on his land, and has received technical assistance from the Soil Conservation Service.

Of his 3,550 acres, 2,200 are in cultivation and 1,350 acres are in range. He keeps around a thousand acres in wheat, while another thousand acres are being fallowed. He grows feed crops on about 100 acres.

Fritton did his first stubble mulching last summer, using two 16-foot machines hooked together so he could plow a 32-foot strip at one time. The wheat was drilled in rows 14 inches apart and a good stand was obtained. Snows which fell in November and December melted in February. There was no moisture then until early May.

Despite four consecutive dry years, Fritton hasn't failed to make a crop because of them. He failed to harvest a wheat crop in 1951 because of winter kill and damage from bugs. Last year, he expected to harvest 20 bushels to the acre, but a hail storm caused heavy damage and only an average of 8 bushels to the acre was produced.

Fritton has a herd of 85 Hereford cows and calves. He grazes his cattle moderately on the wheat and produces his own row crop feed. All of the rangeland was contour furrowed in 1936 and 1937 during the days of the SCS erosion control demonstration project. Although grass is short because of the drought, moisture has been held in the contour furrows and has improved the growth.

In addition to his program of stubble mulching, Fritton has terraced 230 acres of his cropland and he farms on the contour to conserve moisture. He carries on a good grass-management program on his range, and has established windbreaks around the farmstead to provide protection from the winds and blowing soil.

HUDOBA HONORED.—The National Association of Conservation Education and Publicity has awarded Michael Hudoba, Washington editor of *Sports Afield*, its national award for conservation writing.

A beautifully engraved black and gold certificate of honor was presented to Mr. Hudoba in Washington, D. C., by J. J. Shomon of the Virginia Game Commission, representing NACEP as former board member and member of the awards committee.

Mike Hudoba, besides being active as a journalist and conservation director of the Outdoor Writers' Association, is generally recognized as one of the outstanding advocates of resource conservation in North America.

"Finer Farms" in the Carolinas

By JACK RILEY

This contest, sponsored by a power company, is helping to put more conservation on the land in two states.

DISTRICT soil conservation supervisors and representatives of Carolina Power & Light Company have joined hands in a project that is giving greater impetus to soil and water conservation in the Carolinas.

This is the "Finer Farms" phase of the contest sponsored by the power company with the expressed objective of "helping to build a Finer Carolina." While organized communities vie for prizes in one classification, individual farmers are competing in another which is intended to build a finer Carolina by building finer farms.

In its second year, this contest now has enrolled 1,589 competing farms with a total of 670,422 acres, an increase over the participation in the initial contest.

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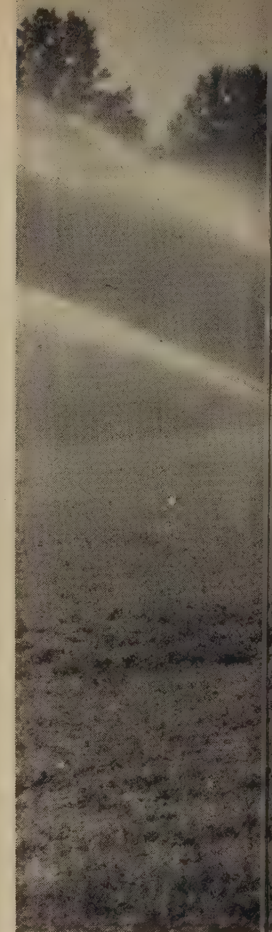
R. E. Creech (left) and work unit conservationist C. W. Warrick stroll between strip of cotton and strip of grain on the Floyd C. Price farm near Pine Level, N. C. Slopes that once washed badly are now controlled by stripcropping and contour plowing.



Interested nei

Lorentz T. White, Sr.,
near Raleigh from pic
birds s

ather on the Joe Tippett farm near Zebulon to see a demonstration of supplemental irrigation, and to view such soil-saving practices as meadow stripping, contour plowing, terracing, and stripcropping.

ump which irrigates his pasture lands pond which he has stocked with exotic he swans at lower left.

There once was a shoulder-deep ditch where Harold Peedin (left) and C. W. Warrick walk. Peedin tile-drained his entire farm, until now there isn't an open ditch on all 60 acres. He reclaimed many acres of unproductive, sour swampland.

Soil conservation districts and representatives of the Soil Conservation Service, from state level to local work unit conservationist, are cooperating in the contest in 48 North Carolina counties and 12 South Carolina counties which are eligible to enter. Soil conservation specialists are serving as judges of the individual farmer competitors. Tenants as well as landowners are eligible.

Individual prizes of $300, $200 and $100 will be awarded winners in each of three groups: farms of less than 100 acres, 100-400 acres and over 400 acres. Three county prizes of $250, $150 and $100 each will be awarded in two classifications: most acres entered and greatest percentage of the county's farms entered.

A recent tabulation of entries showed 1,021 North Carolina farms with 259,718 acres had entered and that 568 South Carolina farms totaling 410,704 acres are competing. There are 541 small farms in the competition, 678 middle-sized farms and 330 large farms competing, with 40 unclassified.

The winners will be announced early in 1955.

On the advice of their work unit conservationists, Carolina farmers are instituting a variety of practices prescribed specifically to make the most of their own acres. Strip farming, waterways, terracing, contour farming, farm ponds, wildlife borders, reforestation, drainage and pasturage are among the many practices instituted on farms in the contest.

Note.—The author is director, publicity department, Carolina Power and Light Company, Raleigh, N. C.

Technician George Winchester and Joe Tippett discuss the practices that have increased Tippett's tobacco and pasture yields manyfold. Among them is supplemental irrigation.

Fall affords J. D. Tippett time to disk and reseed the meadow strip which carries the runoff water along the ground between row crops. Such soil-saving practices are part of this young farmer's program as a contestant in the "Finer Carolina" competition.

Whether soil suffers erosion from rapid runoff on hillsides or the opposite evil of poor drainage in flatlands, there is a plan available to fit any farm. That fact was graphically demonstrated by two Johnston County neighbors who are "Finer Carolina" contestants.

One, Harold Peedin, faced the problem of draining flat, sour land. Not far away, Floyd C. Price, Jr., wanted to anchor hilly soil severely damaged by rapid runoff. Both men found a conservation plan that worked.

Peedin laid tile drains and closed every open ditch on his farm. He reclaimed acres previously non-productive, and even his lowest land now produces pasture for beef cattle. He practices water conservation by draining his land into a farm pond which waters his cattle, produces food fish and affords fire protection. He plans an irrigation system to pump the water back to the same fields during dry periods. The only washoff goes into the pond, where it supports fish.

"Peedin offers a fine example of conservation practices properly adapted to flat, coastal plains land," comments E. C. Jernigan of Raleigh, soil conservationist for a nine-county area. "He has converted poorly-drained land into high-capacity land."

Not far away, the Price farm solved the opposite problem by contour plowing and strip-

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How Thirsty Is It?

By ROY E. BALLARD

"HOW Thirsty Is It?" was a question asked at a meeting of the Board of Directors of the Tehachapi (Calif.) Soil Conservation District. It referred to the soil and its capacity for absorbing additional water that might be made available. Other questions ran: Is there runoff water now being lost which could be conserved by spreading to recharge the underground supply? Are there suitable sites for such spreading?

The board was concerned by the underground water situation resulting from a period of several dry years, and by the reports from various local ranchers of the necessity of lowering pump bowls and of the reduced production of certain wells.

Note.—The author is work unit conservationist, Soil Conservation Service, Tehachapi, Calif.

Operations on site C-1456-8. Bliss drives infiltrometer into ground; Johnson puts hose in place.

Transfer of water from tank to drum on site C-1456-10.

When men of the caliber of these directors—J. C. Jacobsen, Jr., Don I. Carroll, Milo Sprinkle, Walter Eisenman and Pete Vukich—are faced with a problem of such gravity, you can expect some sort of action toward a solution. A special investigation seemed in order. Accordingly, a request for assistance was presented to the Agricultural Research Service.

Leonard Schiff, hydraulic engineer and project leader at Bakersfield, Calif., was put in charge of the study, with Eldred S. Bliss and Curtis E. Johnson supporting him. He designed a course of action involving three principal steps.

First, the topography was carefully charted. This was done by use of topographic sheets and from observations during on-the-spot field tours.

Second, soils were investigated, with a determination of the location of various soil types. This was designed to fix the sites most favorable for water penetration. Capability maps, prepared by soil scientists of the Soil Conservation Service, proved valuable.

Third, other relevant data such as rainfall records and verbal information supplied by

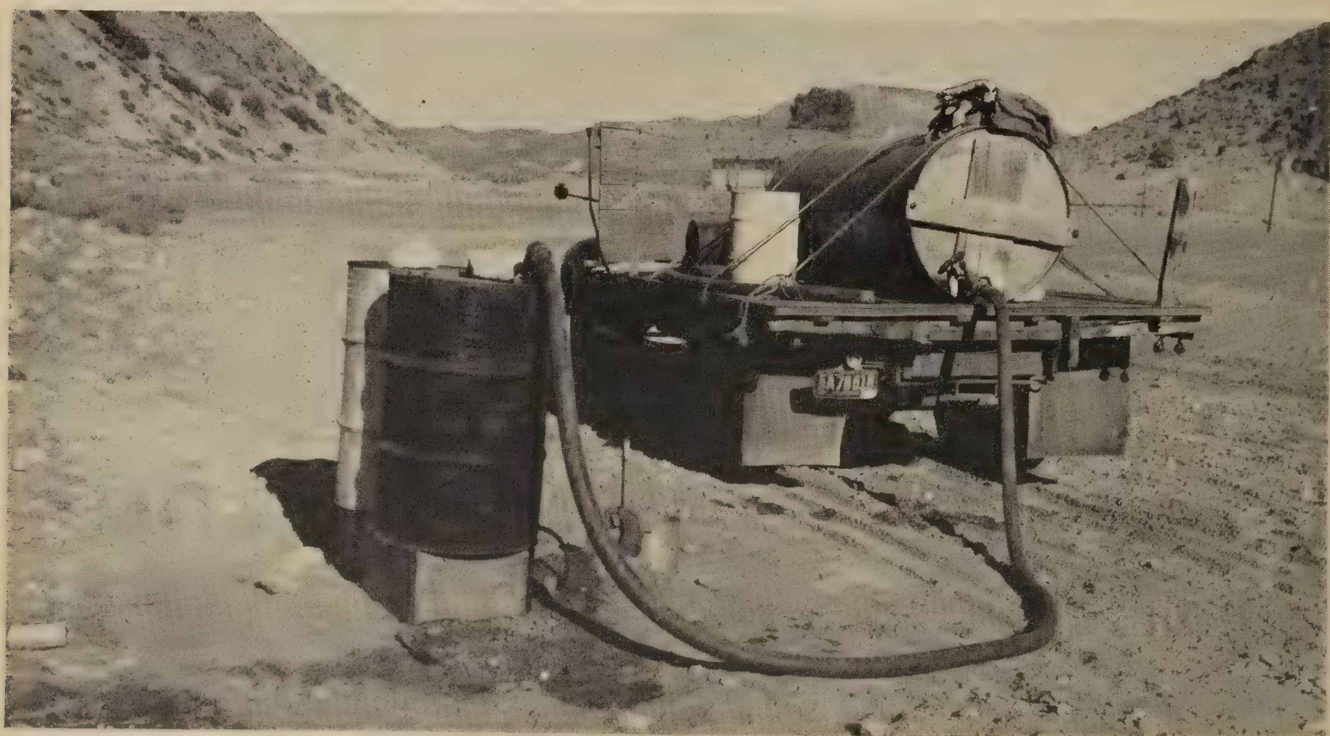
Tehachapi residents, were scrutinized. It was revealed that considerable winter flow, particularly, in wet years, either left the valley, evaporated, or entered the soil at less desirable locations.

From all this, it was seen desirable to collect infiltration data from a few key points, by means of ring infiltrometers, with the idea of finding out exactly how thirsty the soil was. Five advantageous places were selected and infiltrometers established.

At one site (C-1456-8) Bliss drove an infiltrometer into the ground while Johnson placed water hoses into the drums which served as a reservoir to provide a source of water supply. At a second location (C-1456-9) Schiff relieved Bliss and pounded the infiltrometer into the earth. When the equipment was completely installed (C-1456-10) he made a final check to see that the infiltrometer, at that site, was properly established and ready for operation. A few minutes later, data recordings began.

The setup was simple. Briefly, here is what it was and how it operated. The ring infiltrometer was a metal tube, 9 inches in diameter in this case, driven into the soil to a depth of approximately 18 inches. Two 50-gallon oil drums were adapted to serve as the reservoir supplying the water. A float valve was inserted inside the infiltrometer to regulate the water level inside the tube. One-quarter inch rubber tubing, joined together by a glass Y-tube and connected to the drums and to the float valve, completed the setup.

Work at second location, C-1456-9, as described in this article.



Closeup of equipment at work on site C-1609-8.

The apparatus was easily operated. The drums were filled with water. To accomplish that task, a 150-gallon tank was placed on a pickup in one instance (C-1456-10). In another, a 300-gallon tank was assembled on a 2-ton truck (C-1609-8). In each case, it was merely a matter of driving to a well, filling the tank, and transporting it to the infiltrometer location. There, transferring the water, through a tube or a hose, into the oil drums by gravity.

When the drums were filled and all adjustments properly made, the time was recorded on a data sheet and the operation was begun. Before all of the water had drained from the drums, a measurement was made from a predetermined reference point to the surface of the water inside the drums. That distance and the time were recorded onto the data sheet. The drums then were refilled, the time recorded, and the process repeated.

By collecting the data for a number of hours, varying with the soil type, the penetration rate was found for a given spot. By conducting comparable operations at a number of sites, the penetration rates of different soil types were found and compared. In other words, the question, "How Thirsty Is It?," was answered. On completion of the project, it was concluded that water spreading was feasible in certain areas of the Tehachapi Valley.

Even now, plans are being made to establish one water spreading setup, to collect the excess runoff of next winter's rains. Future plans will be based on the knowledge gained from actual field operation.

TALL GRASS DEFEATS PRAIRIE DOGS

(Continued from page 105)

ber 6 included a large percentage of silver bluestem and side-oats grama. The few prairie dog mounds we found were covered with the same plants.

Finally we came to the belt at the edges of the valley next to the wooded hillsides. There was no evidence of prairie dog activity, and the plants were typical of virgin prairie. In this zone big bluestem and switchgrass showed up markedly. Little bluestem and Indian grass were present.

With the historical and plant information at hand we were able to reconstruct the story of the prairie dog colony. We knew, from studies that others have made, that the various zones of plants represented typical stages of the invasion of bare areas by plants in the tall grass prairie. We were sure that prairie dogs did not originally occur there, but had come in at some time after the range had declined through heavy grazing by livestock. We found that other dog towns where bison grazed intensively were spreading in spite of control measures. In other words, the prairie dogs were closely associated with heavy grazing by larger animals.

Following the removal of cattle, the taller weeds and grasses began to move in on the Grace Mountain prairie dog town. In spite of the prairie dogs, which do not like tall vegetation, these plants began to cover the land. That crowded the prairie dogs into a smaller area. But the vegetation continued to close in. Perhaps some of the prairie dogs moved out as their town became crowded. There's some evidence that new dogs appeared in a town near Bakers Peak—a mile away—perhaps from the Grace Mountain town.

At last the colony became so concentrated that the prairie dogs completely destroyed their food supply. Only the unpalatable three-awn remained in a band which hemmed them in. That finished them.

On the basis of our study of the abandoned center of the Grace Mountain prairie dog town we thought it likely that the few dogs remaining a quarter mile away soon would go, too. "I had occasion to visit the town again on August 16," Ernest Greenwalt wrote us in 1947, "and there was no sign of any live dogs about. Our sacred town is depopulated." On April 30, 1948, Allan looked over the dog town. The last burrows to be vacated were becoming covered with vegetation. In the study area grass was now covering the once bare ground. The grass had destroyed the prairie dogs. (The scientific side of this story is contained in an article published in the July 1949 issue of *Ecology*.)

Maryland's Eastern Shore Revives

Farmers of six counties dig themselves out of the mud, and thus make possible a comprehensive program of soil and water conservation.

Drainage and clearing help Eastern Shore poultry farmers to develop their industry by providing excellent ranges. This farm is in Dorchester County.

By HUGH F. EAMES

WHEN a small group of farmers around Willards, in Maryland's Eastern Shore, couldn't agree on a plan to revitalize a group drainage system that had become useless after 50 years without maintenance, Joel Rayne, a general and poultry farmer, made this declaration of independence:

"I've been farming around here since 1938 and I'm tired of living in a mudhole! If we can't agree on group action, I think I can find a new outlet. If the Wicomico Soil Conservation District will help me, I'll dig the ditch and pay for it, and also pay for a better drainage system at my farm."

Technicians of the Soil Conservation Service, who work with the district, found a way. Eighteen old ditches were closed, a new 1½-mile main outlet ditch and 6 new lateral ditches, each about 2,200 feet long, were dug. The whole system cost Rayne about $6,500 and benefited all but 10 of his 130 acres.

Before this happening, Rayne had 28 fields of varying sizes and shapes. Use of equipment was limited and slow. There was much turning, the wear on machines was heavy, and costs were excessive. Since drainage was installed, he has reorganized his cropland into five 12- to 15-acre

rectangular fields where he does almost all the work with labor-saving equipment. He's free of "short rows."

Before drainage, Rayne's land was always wet. Almost every year in some fields he lost at least half of his production. In 10 years one field had yielded only 2 crops. In 1953 on land where plowing had taken 15 hours, he could do it in 5½ hours.

Rayne's production per acre has increased at least one-third. Costs in fitting land and planting, producing and harvesting crops have been reduced one-half. In 1953 he had excellent yields of soybeans and corn and he marketed 54,000 broilers. His enhanced income has permitted him to make improvements, and to turn it into a highly productive enterprise. Now he has means to buy, and time to work 68 more acres—a second farm—and also to operate his father's 224 acres.

Other Wicomico farmers have taken notice of Rayne's experience. That's why drainage systems at 26 different farms in the Willards area have been redone. It's why more and more group drainage jobs are being undertaken.

Drainage work done by district cooperators runs to about 2,900 miles. If it could be stretched out in a straight line, it would reach from Salisbury, Shore metropolis, to a point in the Pacific 460 miles beyond Portland, Oreg. This straight line would include: 57.78 miles of diversion ditches, 73.80 miles of terraces, 729.00 miles of outlets-farm water courses, 25.89 miles of tile ditches, 2,011.11 miles of open ditches.

These drainage facilities are spread over 7 out of 8 counties. Talbot is the only county in Maryland that doesn't have a soil conservation district. More than 85,000 acres have been benefited by the 2,037 miles of open and closed ditches. In addition, water management and conservation and good land use have been forwarded by establishment of 1,273 acres of contour furrows and construction of 234 farm ponds. Progress has been made in such related projects as shore- and streambank-erosion control and stream-channel improvements.

About 40 percent of Shore farmland needs drainage. Through long years this condition has shackled farmers in 6 lower counties. To a much lesser degree, it has plagued farmers in some parts of Kent. In Cecil, northernmost county, excess water generally is a comparatively minor conservation problem.

In the 6 lower counties, at varying degrees, drainage is the problem that almost every farmer has to solve before he can get many other benefits from his soil conservation district program.

Because soil conservation districts represent the most effective means of attacking their drainage problems, Shore farmers in the 6 lower counties have launched 83 group programs organized under state tax ditch laws. These call for 312 miles of ditches to benefit 149,000 acres in 1,528 farms. District cooperators already have completed 58 of these projects in which 258 miles of ditches benefit 71,208 acres in 951 farms. The cost has run almost $600,000.

These projects do not constitute all Shore drainage activities, because group ditching was done long before the districts arrived. Old records show 229 such projects involving more than 1,000 miles of ditches for the benefit of 416,000 acres in 5,214 farms. Some are only intentions,

At the left you see what happened in the Green Branch main ditch, flowing into the Pocomoke River, when it was not maintained. It grew up to duck, flag and smartweed, and cattails, and could not move excess water. After being cleaned out and put back to work as at the right, it can move excess water from 6,000 acres.

have never been planned for construction. For others, the planning is done, but digging has not been started, or is only partly done. Among completed jobs, some give service, but others have become ineffective, sometimes totally, because maintenance was overlooked. Now, in the soil conservation district system, serious attention is given this factor.

Accomplishments of district cooperators in applying other conservation and good land use practices are not as striking as those in Maryland districts that do not have such intense drainage troubles. The 4,100 Shore cooperators on January 1, 1954, in an average of 8 years of operation, have, however, built up such impressive totals as the following: 63,891 acres of cover cropping, 140,621 acres of crop rotations, 15,992 acres of mulching, 32,080 acres of contour farming, 5,477 acres of clearing, 10,394 acres of stripcropping.

Results from these general practices were apparent in the 67 million dollars cash income that farmers in the 8 counties received from their 1950 marketings of all farm products. Five years earlier the figure reached only 55 million dollars.

Participation in the national grassland program, under the districts, is found in such accomplishments as 28,078 acres of pasture improvement, 6,303 acres of pasture seeding, 6,909 acres of permanent hay.

These three practices, and some in the general list, are particularly important to dairy farmers. With production of more and better hay, pasture and grass silage, and harvesting of more grain, and more corn for silage and grain, they increase the size of their dairy herds, market more and better milk, and buy less feed. The Census shows that the 8 eastern shore counties in 1950 marketed 27,583,338 more pounds of whole milk than 5 years earlier.

Conservation farming also reaches into farm woodlots. District operators in 8 counties have put 84,334 acres of woods under district protective and improvement programs, including selective cutting. They have reforested 1,461 acres that will not produce any crop except trees.

In the 8 counties nearly half of the farms, more than half of the acreage in farms, and almost three-fourths of the full-time farmers are in soil conservation districts.

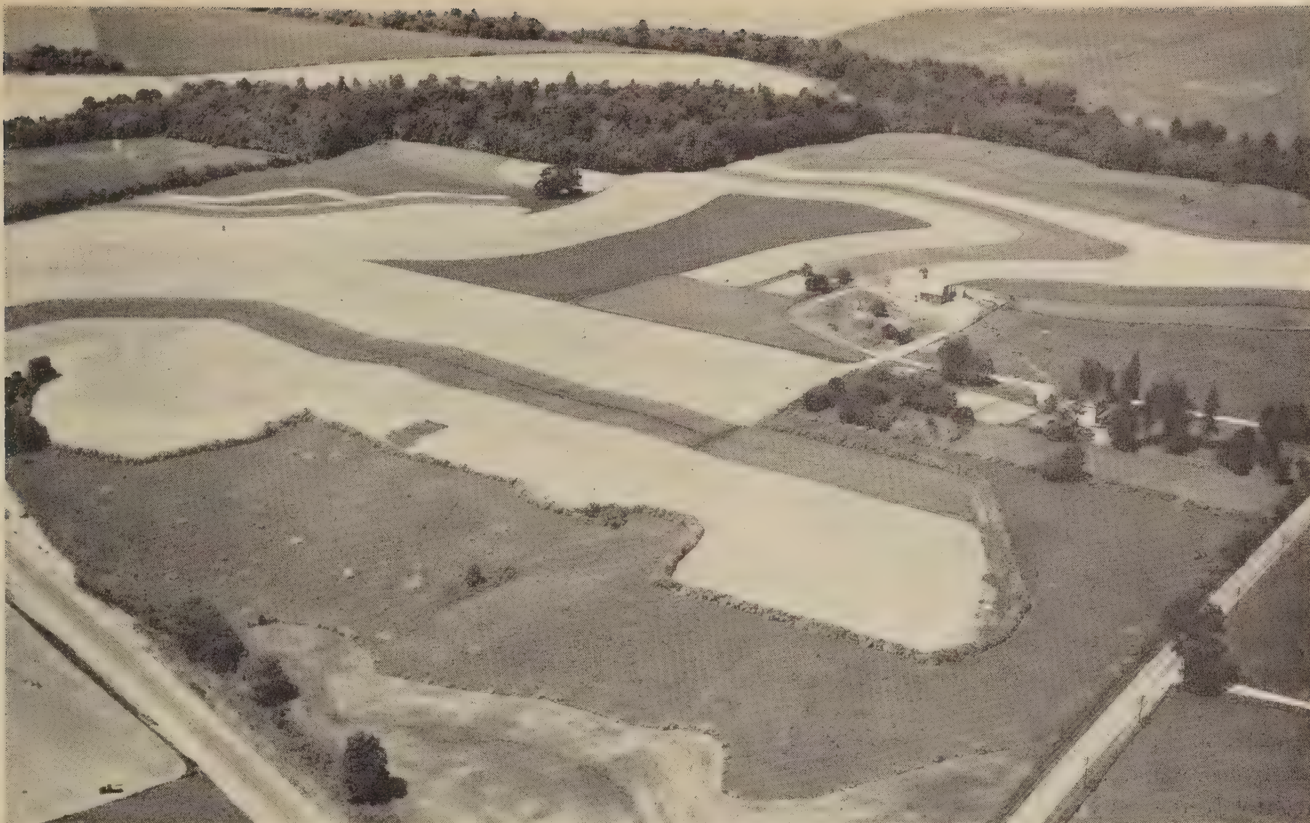
Throughout the Shore, the influence of soil conservation districts and conservation farming touches almost every phase of human activity. In Caroline, for example, businessmen, educators, clubwomen, veterans, manufacturers, bankers, professional men and clergymen, as well as almost all farmers, are among the most enthusiastic supporters of the soil conservation district.

The Rev. Wilson Davis, modern Methodist circuit rider who serves congregations in Ridgely, Bridgetown and Thawley in Tuckahoe Neck, preaches soil and water conservation, good land use, and district cooperation from his pulpit throughout the year, not only on "Conservation Sunday."

Willie S. Carroll, Ridgely farmer since 1928, has two farms under plans with the Caroline Soil Conservation District. He has had a 75 percent increase in production. "A lot of Caroline county farms would have been abandoned if our district hadn't been started," he declares, in emphasizing that so far as he knows "there isn't an abandoned farm in the county." He remembers when farmers were warned not to buy certain farms because they were so unproductive. Now, under the district program, these same farms are top notch producers.

County commissioners have special interest in what districts do to promote better handling of farmland. They have seen thousands of acres more of cropland appear since the soil conservation districts were organized. The addition of this land for productive purposes has meant raised valuations and a broadening of the tax base. It benefits every taxpayer. The commissioners also appreciate the fact that improved farm drainage has brought better roads and cut the cost of their upkeep. This, too, helps every taxpayer.

John E. Rolley knows the help that a district can be when you have as little as 5 acres of cropland. He bought a 179-acre farm in Somerset County, in cooperation with the Farmers Home Administration, on his return from World War II. The Somerset Soil Conservation District helped him along while he was studying with GI and vo-ag groups, catching up on new methods of making the best use of his land. It has also spurred him to increase his cropland to 40 acres on which he grows grain, soybeans, corn and tomatoes, and maintains



Cumulative benefits from skillful blending of good land use and soil and water conservation practices into a farm-wide program, applied and maintained through 15 years of earnest effort, are found on Stanley Sutton & Son's 134-acre Bittersweet dairy farm near Chestertown, Kent County. Rundown, washed-out, fertility-depleted fields have been transformed into a teeming enterprise that annually attracts many visitors who want to find out just how it was done.

improved hay land and pasture for his beef herd.

Sychronizing the operation of 1,800 acres, operated in about a dozen farms, into one smooth operation, was successfully accomplished by Mervin Selby. Selby is a former lumberman who is now a grain and livestock farmer near Girdletree. On 400 acres of cropland he gets maximum efficiency, using modern labor-saving equipment and handling the work with two full-time and two seasonal workers. He took advantage of the facilities of the Worcester Soil Conservation District.

On gummy old "clay-pipe" soil that had grown up to trees and brush and become littered with other obstructions, and where a century-old drainage ditch had been neglected for 50 years, he spent $4,000 in drainage and clearing work. He's getting excellent yields of corn and soybean where he had never before harvested a crops. Benefits already add up to an increase of at least 20 percent in value of the farm, and will go much higher.

Soil and water conservation practices put T. Jethro Pinder back in business at a farm from which he had been chased by excess water. Of 155 acres which he acquired near Salem in 1946, only 75 acres were in cropland. When he bought the farm he could produce corn and beans, but couldn't harvest them; the land was too wet. Now his yields are up and he harvests everything.

"I'm getting at least a third more production per acre," Pinder says. "I have gained full use of 12 previously unproductive acres. All of my cropland, and the county roads, have benefited from the drainage work. Now that I know how to handle wet land, I have bought and renewed work on a farm from which our family was driven by excess water a long time ago."

The return to productivity of his 110-acre farm at Willards encouraged Thomas W. Davis, who heads T. W. Davis Company operations at Salisbury, to attempt a similar job on another farm. At both farms all operations and improvements are based on 10-year plans.

On 40 acres water stood 4 or 5 inches deep after a storm, and it remained a long while. Digging 2 miles of main ditch cost Davis $2,600. But today, where nothing but blueberries could be produced, he is harvesting good yields of corn and soybeans, producing excellent pasture and supporting beef, hogs, turkeys and 12,000 broilers.

On his 243-acre place, Davis got paying yields of corn, soybeans and watermelons in 1953, the year the 86-acre clearing and 100-acre drainage jobs were done. Corn production there ranked second in the 1953 Wicomico 100 Bushel Club competition, with a yield of 87 shelled bushels per acre. The county average is about 30 bushels.

At Town Point when you come upon what might well be called "Bread Crumbs Farm," there is evidence of the help that livestock farmers get. The suggested name is logical because bread crumbs are a highly important ingredient in the animals' diet. The 145-acre farm is owned by George Huber, for whom Arthur Johnston has been farming for a quarter century. When Johnston first arrived there, he likes to recall, "you could hide a house in one of the many gullies." In his land use and treatment program with the Cecil Soil Conservation District, many of the marks of erosion have disappeared; others, healed over, remain as reminders of past follies. The good results come from stripcropping, and from more than a mile of diversion ditches and outlets developed in 3 years.

In earlier years Johnston produced corn, wheat and soybeans, and operated a dairy. Now he grows only grass and soybeans, and sorghum for silage. None of the livestock gets corn. In its place the beef herd and pigs receive a ration of bread crumbs twice a day, generously mixed with other feed. "Bread crumbs for livestock will work well for any farmer," Johnston comments, with a chuckle, "if he has a bakery." Johnston gets his unlimited supply from the Huber Baking Company at Wilmington, Del. Huber owns the bakery, as well as the farm.

J. Walter Candy, who has farmed the 213-acre C. L. Roe place, near Church Hill, for nearly a dozen years, is the Queen Anne farmer who probably has the widest range of conservation practices on his land. He has been working in the program since 1953 and has a few more practices yet to start.

Candy has established 32 acres of farm drainage and nearly a half mile of diversions. He has licked erosion and lifted fertility by putting 30 acres into contour strips and furrows, and 152 acres into crop rotations. Fifty-seven acres of pasture have been improved, 16 have been reseeded, and about 2 acres of wasteland have been cleared and put into production. Pigs, corn and milk roll to market as cash crops. In 1953 this farmer's beans averaged 30 bushels per acre on land that had previously been almost worthless. He planted winter oats in the spring and got an average yield of 40 bushels per acre. "Work done with the Queen Anne Soil Conservation District is the heart of all this progress," Candy declares.

Alton Spear, Vienna banker, shows how conservation farming through district cooperation has put a badly rundown farm back on its productive feet, after long efforts with obsolete methods had failed. In the early thirties, Maple Grove farm, near Vienna, was slipping down the skids; everything was being taken out of the soil, nothing was being put back. After 5 years of crop failures, a bank took over the property; during the next 5 years it, too, made a bad farming record, because it followed the same old practices. Then Spear bought this farm of 448 acres and put his sons, Robert and Gene, in charge. Backing them up, as cooperators, was the Dorchester Soil Conservation District.

Improvement started with a 2-mile ditch through the middle of the place. Laterals have been added as income has permitted and, at a cost of about $3,500, the drainage system is now 90 percent completed. "It's a good investment from a farmer's or a banker's viewpoint," Spear declares. Production on 100 acres of cropland is up to 100 percent. Tax assessments have been boosted twice. Income to meet all operating and improvement needs, and yield an investment dividend, is derived from such annual production as 140 acres of corn, 120 acres in wheat, 50 acres of snap beans and 20 acres of lespedeza. In 1953 Spear marketed 1,800 barrels of corn and 112 tons of beans.

In the mid-August '53 hurricane Charley Powell, Newark farmer, saw some spectacular

Drainage, clearing and sound farming methods have put acreages like these back into top production for Wicomico's T. W. Davis. The wooded section at the lower right, once cleared and highly productive land, is going back to cropland via the drainage-clearing route.

At the Maddox farm, Westover, the 107 acres seen here have been lifted from little or no cropping use into top-flight production by draining, clearing, and good conservation farming, in cooperation with the Somerset Soil Conservation District.

Chris Nagel paid $1,000 for this 85-acre farm near Federalsburg, Caroline County, when sale was forced because the land was unproductive. Today he puts the farm's value at $10,000.

things happen. In 70 years, old timers declared, "We never saw so much water fall in so short a time." Water was knee-deep in fields where Powell was growing soybeans. The drainage work done a year earlier proved its worth the next day when all excess water had disappeared from Powell's fields. Instead of losing his crop, Powell harvested a top yield of 25 bushels per acre. The whole drainage system had cost him $750, and in the deal he had gained 9 acres of cropland.

Ellis Ayres is one of three brothers who are doing topnotch conservation farming on 600 acres in 3 farms in the Farmington area. They cooperate with the Cecil Soil Conservation District. Ellis operates a dairy farm, with hogs and turkeys as sidelines. At a total expense of $250 in hard cash he has overcome his problems of excess water and erosion, obtained 54 more acres of pasture for his cows, and made a deep cut in the cost of his bought feeds. Since he switched to contouring, corn production on 40 acres has soared from about 70 bushels per acre to more than 100 bushels per acre. His total production is up at least one-third. "I'd use the conservation system even if I had only a 6-acre place," he says. "It is something that no farmer can afford to pass up."

Walter B. Harris, Sr., widely known Still Pond farmer, puts the same conclusion in other words when he says: "Conservation farming is best for the land, best for the farmer, and best for all those who eat or otherwise use what the farmer produces."

REPORT ON TREE FARMS. — The American Tree Farm System through which private woodlot owners are growing trees as a commercial crop has passed the 31,000,000-acre mark, according to American Forest Products Industries. This is an increase of 2,608,292 acres during the past 12 months.

Biggest gains were registered in the South. Florida's Tree Farm acreage jumped from 1,447,000 acres a year ago to 2,451,000 acres. Texas maintained its national lead with 3,366,000 acres. Georgia's acreage was 1,031,000 and Mississippi's totaled 1,178,000 acres. Louisiana gained over 100,000 acres for a new total of 1,578,000.

Started 13 years ago in Washington, the American Tree Farm System is now operating in 36 states. The acreage certified thus far is only a portion of timberland under good management, AFPI says. More forestlands will be brought into the program as rapidly as possible.

"FINER FARMS"

(Continued from page 110)

cropping to impede runoff. Alternating grain strips and row crops, following the contour, empty into "meadow waterways" which channel it off slowly enough to hold back the topsoil.

"All soil conservation practices I have seen have paid dividends," said Price, whose $3,100 investment in conservation netted $2,000 the first year. "It has gotten me out of the red in my method of farming."

Similar opinions prevail among the hundreds of "Finer Carolina" contestants.

T. F. Foster of Blanch, Route 1—a first-year winner—says his conservation practices raised corn yields from 20 bushels to 75-80 bushels per acre and tobacco from 1,200 to 1,400 pounds per acre on eroded Caswell County soil. Foster says he instituted a conservation plan when he first bought his farm in 1939 and has heeded SCS, FHA, PMA and extension specialists' advice ever since.

One farmer-philosopher, Joe Tippett of Zebulon, Route 3, commented: "I know I can take care of myself. But I wonder how the children and their children, and future generations will fare. Farsighted farmers should put back into the land as much as they take out, or more."

REVIEWS

THE BUFFALO HUNTERS. By Mari Sandoz. 372 pp. Illustrated. 1954. New York: Hastings House, $4.50.

"The Buffalo Hunters" is a new book that belongs in the reference library of biologists, conservationists and Americana collectors. It is the latest by Mari Sandoz, author of "Old Jules" and "Crazy Horse." This one belongs in a class with these two but will appeal to a much wider range of readers.

This book contains far more than the story of the reckless slaughter of millions of American bison. It is a history of the vigorous military and pioneering epoch of the Great Plains that preceded the settlement of the West.

The aboriginal hunters who killed meat for a few hundred thousand sedentary American Indians made little dent on the buffalo numbers in central United States. Even later, when the Indians adapted the horse for use in hunting, their annual food requirements were far less than the natural buffalo increment. They lived in a land of plenty. This dramatic story gives the gory details of how white hunters reduced the immense buffalo herds to less than 700 between 1867 and 1883. In 1881 a winter buffalo hide brought $3.50 in St. Paul and Chicago. A robe brought $7.50. The hide and robe business was good for new railroads but the heartless killing caused the Indians to fight until finally they were conquered and confined to reservations.

The stories of many colorful characters are part of the history of the great buffalo slaughter. Miss Sandoz takes the gloss and popular wrappings from many of these illustrious figures. Buffalo Bill Cody she calls "Broadway's Scout of the Plains." The real hide and meat men were Billy Dixon of "Adobe Walls" fame, Lonesome Charley Reynolds and Wild Bill Hickok. Claims are made that Lonesome Charley got more meat per hundred cartridges than any other hide man. Wild Bill was a bigger draw as a hide man than he was as a frontier marshal, despite the fact that his popular reputation was built around gun shooting the Hard Cases of Dodge City, Abilene and Deadwood. General George Custer is portrayed in his lesser known roles as squawman and Indian raider.

A few humanitarians cried out against the wasteful plunder but the viewpoints of men like General Phil Sheridan, who said when the buffalos were killed the Indian uprisings would end, prevailed. This was true, of course, but that didn't absolve the hide hunters from blame for the wanton slaughter of American bison.

Brawling and Indian fighting were part of the buffalo hunting era and the author gives much interesting detail on this feature. One of the most dramatic chapters deals with the Indian attack on Adobe Walls in the Texas Panhandle.

If you want to dig deeper into the fascinating history of buffalos and buffalo hunting, Miss Sandoz has provided several pages of bibliography on the subject at the back of her book.

—B. W. Allred

JANUARY 1955

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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NEW DIRECTORY.—The National Wildlife Federation, 232 Carroll Street, N.W., Washington 12, D.C., has released its new directory of organizations and officials concerned with the protection of wildlife and other natural resources. Price is 25 cents. This 52-page directory is extremely helpful to those who want the names and addresses of officials of various state, federal and private conservation organizations.

KANSAS LAKES.—Ten new Kansas lakes are either now completed or will be soon. The addition of these lakes increases the number of state lakes under Kansas state government supervision from 22 to 32. The lakes enlarge the total state park area by 2,220 acres and add more than 690 acres of fishing waters.

ADULT EDUCATION FUND.—The amount of $7,500 will be provided each year by the Montana Fish and Game Commission for conservation education in Montana State University and Montana State College, according to a recent announcement. Emphasis will be on adult education.

FRONT COVER.—Ptarmigan in the Gunnison National Forest, Colorado. Wildlife always has an important part in the land ecology.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

If It Rains

By GEORGE W. MUSGRAVE

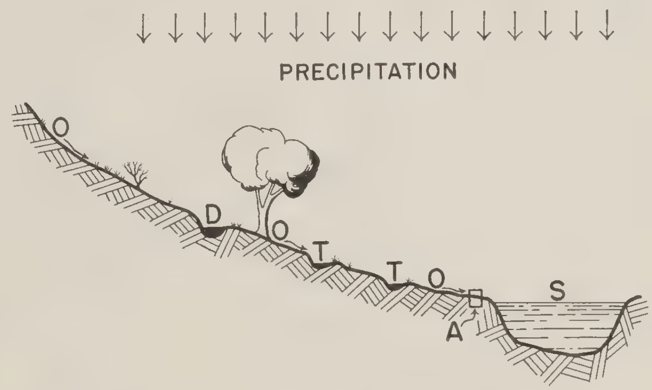
IN SOME places where people have not seen rain for many months, "if it rains" may raise questions as to what may happen. Most of us think we know what happens when it rains. But do we, actually?

We know that rain wets the ground and the vegetation. We know that some rain goes into the ground. The amount may be enough to grow a crop. At other times, most of the rain runs off. At intervals there may be enough penetration to replenish springs and wells that are nearly dry. At other times the same amount of rainfall fails to produce these effects. On some soils farmers are known to plow within an hour after a heavy rain and have no bad results—a very common occurrence in parts of Cuba and other places in the Tropics.

If you ask how much of a given rain will go into a certain soil, you have a good chance to stump the experts. Or you may ask how much will stay in the root zone for as long as a full day. When you advance such a query, you are asking "the $64 question." No one can give a precise answer with any assurance. Usually the answer must be based on other "ifs"—*if* it rains as much as 4 inches; *if* it is a slow rain; *if* the ground was already moist, for example.

Much of the science of farming, of the conservation of soil and of water, depends upon at least approximately correct answers to questions like these. In the last 25 years there has been a tremendous advance in our ability to find the answers.

To show how great has been the change in thinking, let me confess some of my own ignorance as of 1929 or thereabouts. I was measuring rainfall and runoff. The question arose: What happened to the water that did *not* run off? Discussion with many state and federal workers did not provide an answer. Therefore, a small experiment was set up to try to see what could be found out. If we applied manure to some of the test areas, how would it affect the amount of rainfall entering the soil; the amount of water held by the soil; the amount and rate of movement of water through the soil? Many of the people with whom we talked (including co-workers, farmers, a county agent) thought manure would slow down intake of rain and movement through soil. This wrong idea, of course, came from our lack of information. Today we know that the opposite is true but our first published report dealt with cultivation and its effect on intake.

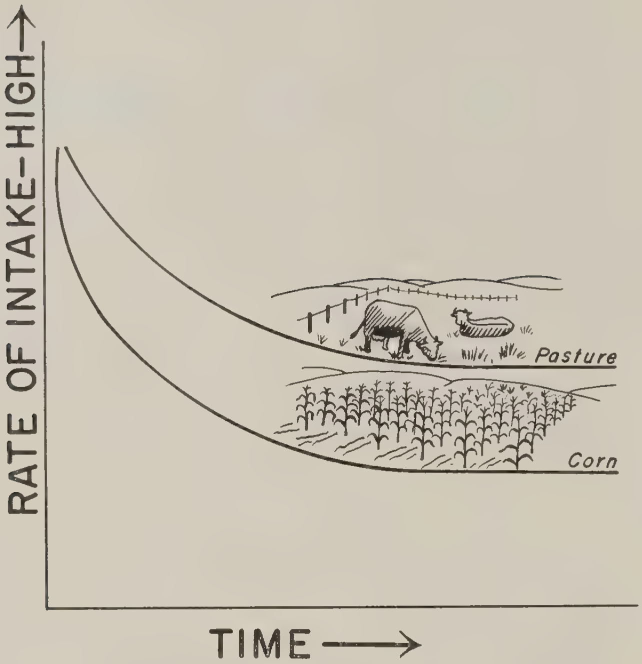


The rain comes. It wets the landscape, starts flow in diversion ditches (D), fills terrace channels (T), produces flow (O), and adds to streamflow (S). What happens within the block of surface soil (A) is described in this article.

In those early days of studying what happens to rainfall, other people, too, had mistaken ideas. A very famous engineer considered that the amount of water entering the soil in the first 15 minutes was the same in amount as that entering it during any other 15-minute period. Though we now know that the rate of intake at the beginning is higher than that of later periods, such information was not available 25 years ago.

The amount of rainfall on a forest or cornfield is greater than that reaching the ground beneath such a canopy. A snowstorm on a pine forest makes a fairyland of beauty because part of the snow never gets to the ground. Rain, also, may be held on vegetation, the amount depending upon the density of the vegetation and the kind of storm. This amount may vary from 0.01 inch to 0.30 inch or more.

Note.—The author is staff specialist (infiltration), engineering division, Soil Conservation Service, Washington, D. C.



Rates of intake of water by soil growing corn and by land in bluegrass pasture, showing that the rate on both declines as time (i.e., hours of rain) increases but the rate in the cornfield declines much more rapidly than that in the pasture.

But far greater in importance than the difference in amount reaching the ground is the protection the vegetation provides the soil against the pounding of the drops. A sharp shower on bare ground really tears the soil apart but the same rain on a good meadow may do little damage. This we all have observed many times.

One of the worst things that happens to the bare ground is that its surface is sealed over by muddy water, and later rains do not readily enter the soil. But this does not happen in the good meadow nor the good forest. Nor does it happen when the wheatgrower has applied a straw mulch to his field, nor when subsurface tillage is practiced so that the remains of a preceding crop are left on the surface. Let's take an actual case. Measurements of the capacity of a soil typical of the Corn Belt have been made and the hourly changes in moisture movement when it rains carefully noted.

The measured rates of intake of water by soil growing corn and by land in bluegrass pasture are shown in the accompanying chart. The two fields start with a rate above 1 inch per hour, indicating that rain of 1 inch per hour would be entirely absorbed for a few minutes under either condition. After an hour, the intake rate on the corn has dropped to about half an inch per hour, but the pasture has dropped only to 0.8 inch per hour. After 5 hours the corn ground has dropped to 0.18 inch per hour but the pasture, at 0.29 inch per hour, is 60 percent above it! During the 5 hours the corn ground has had a total intake of 2.17 inches and the pasture 2.77 inches. This difference of 0.6 inch is not unusual and actually is often exceeded on deep soils. It is about the same as though the pasture received 0.6 inch more rain in one storm—something which, in a dry year, can make a person feel good!

There are, of course, other things that can also encourage the intake of water. On tight soils or soils with naturally low intake rates, improvement can result from such things as building up the organic matter content. This has the effect of forming larger pores in the soil. There are numbers of other ways, too, of retarding flow and giving more time for infiltration, such as contouring, using level terraces, and using close vegetation like grass and alfalfa, in contrast to row crops.

We know much more about rainfall and water *on* the land surface than we do about the movement of water *beneath* the surface. Especially, are we weak in information as to *how much* water moves up, down, or sideways within the soil, at what seasons of the year, and under what different conditions. The greatly oversimplified sketches below may help in showing how movement of water in some one direction also affects movement in another—a matter of real importance to anyone concerned with management or use of water.

The accompanying sketch shows what happens on the ground surface—something we all see and know. But what happens within a block of soil near the surface, like the block labeled "A" in the sketch?

Suppose it rains an inch per hour at a time when the soil is moist. The intake of water and its movement through the soil is often like the case portrayed by the series of sketches that show what has happened at the end of 1 hour of rain; 3 hours; 6 hours; 8 hours.

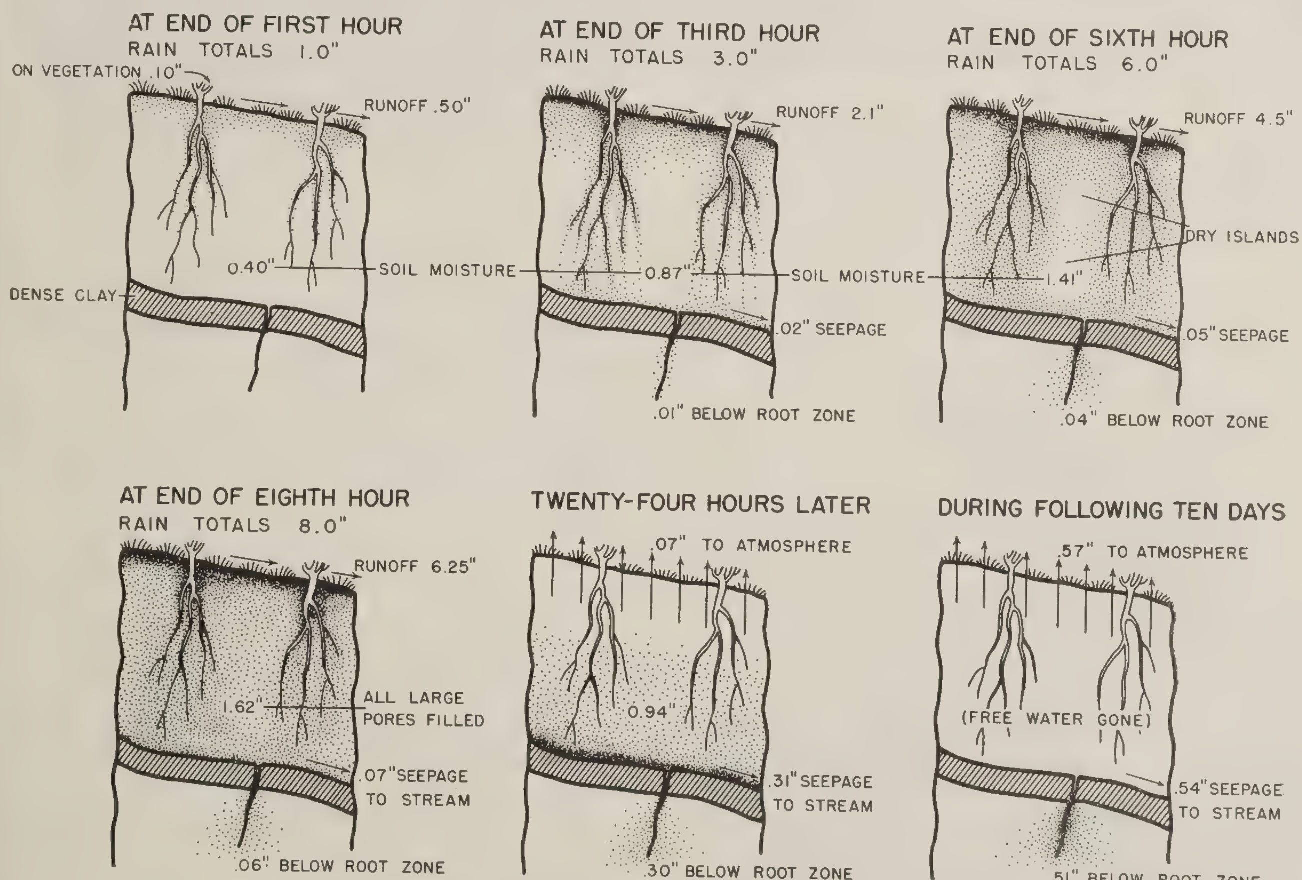
This being a sandy loam with average vegetation on it, a few old root channels in it, and a normal or very common intake rate, we see at the end of 1 hour of rain that 0.10 inch of it is on the vegetation; 0.5 inch has run off the surface; and 0.4 inch has entered the soil, the newly added water being mostly near the surface and along the old root channels.

At the end of the third hour of rain, runoff has totaled 2.1 inch of the 3 inches of rainfall, and a total of 0.87 inch of water has been added to the soil. A little of the 0.90 inch that entered the soil has seeped out toward the stream, moving along a clay layer just below the plant roots. A little has broken through the clay layer and started moving down toward ground water.

After 6 hours of rain, the larger pores of the soil have nearly all filled, although there are still a couple of dry "islands" not yet wetted. Seepage has continued and there has been, also, some further movement to depths below root zone.

During the seventh hour (not shown in the sketch) all but 0.03 inch of the large pore capacity of the soil is filled, so that in the last hour the intake is limited to this 0.03 inch, causing runoff totaling 6.25 inches when the rain stops. Seepage to the stream at this time totals 0.07 inch, and movement below root zone 0.06 inch. Had the impeding clay layer been located deeper, more of the surface water would enter and runoff would be less.

During this assumed storm, occurring under known soil conditions, the intake rate is 0.40 inch per hour at first. Then it drops to 0.30 inch in the third hour, and 0.22 inch in the eighth hour. Thus, the rate is nearly constant at the end of this storm on moist soil, being governed largely by characteristics of the soil.



The intake of water by the soil (marked A in sketch) is only part of the story of what happens when it rains. During the first hour only the upper portion and that along old root channels are saturated. Gradually, with more rain and more intake, the soil becomes nearly saturated and seepage from Block A starts toward streams and deepseated ground water. Note that there still remain some dry islands after 8 hours of rain. After rain ceases, the soil begins to dry out from the top, and in about 10 days loses the water it had gained in this storm.

Rates of intake obtained in this manner for row crops or fallow conditions—that is, minimum rates when the soil has been presaturated and for storms where rainfall is above the intake rate—are most useful in giving to the designing engineer basic figures for estimating runoff from watersheds. Where the land condition is improved, the minimum rates may be adjusted upwards on the basis of experimental data on land condition. They should not be confused with water application rates in irrigation guides, since these are for soils at least partly dry and intended for the irrigator who is applying a certain amount of water to the soil. Typical rate-of-in-intake curves for this soil with good vegetation (bluegrass pasture), in contrast to row crops, show that the rate drops very slowly under grass but much more rapidly for the row crop. On very open soils (with no impeding layer near the surface) the differences are usually greater than shown by these curves. On the tighter soils like the claypans the differences are much less.

After the rain, and as soon as the sun and wind strike the soil, moisture begins to move out. Within 24 hours the newly added water in our sample block of soil has dropped from 1.62 inch to 0.94 inch. Seepage and movement below root zone account for a total of 0.61 inch. About 0.07 has gone in the form of vapor, some through plants and some directly from the soil.

Ten days later all of the free water has gone—0.57 inch as vapor through plants and from soil, and 1.05 inch as seepage and movement below root zone. This brings us back to where we started: a moist soil but no free water. Another 10 days of sun and wind can be counted on to remove a large part of the capillary moisture and the plants will then begin to signal their need for a new supply.

Much has been published showing how intake of water by soils may be increased, how the surface of a permeable soil can be protected so it is not injured by the impact of beating rains, how organic matter in the soil improves movement of water through it, and how the formation of a plowsole or other dense layer can be prevented. These principles are rapidly being applied in everyday farming operation.

Some things about the occurrence of water on or in the soil cannot be changed very much. Even with excellent cover, a high percent of runoff from tight soils is common. The amount of rain and its intensities at different seasons of the year and when vegetation may or may not be luxuriant is an item man cannot control or modify to any appreciable degree. His approach must be that of proper management of the water, the soil, and the vegetation. Experience shows definitely that great improvement is possible.

For wise management of water, soils, and vegetation, all of the many important things that affect their complex relationship must be considered. It is necessary to interpret how one phase of the water cycle affects another: for example, how increased intake of rain affects the total runoff in a stream, or how it is affected by a change in vegetation or by soil characteristics. In the past 25 years we have learned a lot about the wise management of water, soil, and vegetation. We know what will cause an increase in this or that phase of water movement. Mostly our deficiencies in information pertain to *how great* will be the change. It may be that exact prediction of the amount of water discharged by a certain stream in flood flow will be difficult for some years yet, but absolute precision is not required before improvements can be brought about. We are making vast strides in knowledge, and confirming it by the experience accrued over the years.

GIRLS PROFIT, TOO.—The Pennsylvania federation of sportsmen's clubs has been sponsoring a Junior Conservation Camp for 6 years, under the supervision of C. .W. Stoddart, Jr. Last summer 155 boys took the 2-weeks course. This time there was also a course for girls.

How did this innovation pan out? According to the reports of instructors, the girls did some of the work better than the boys. For example, in the compass hikes which were a part of the survival program, no girls got lost. In the four boy's camps, at least one group lost its way each time.

A number of states now have junior conservation camps.

Changing the Face of a Ranch

Grass replaces brush and pickleweed on these California acres. Robert Blohm uses rotation grazing, and production climbs.

This land around the Christ Simon farm was white with alkali before the Emblem bench drainage system was built. It is now under a good cover of grass.

By AL BODE

ONE THOUSAND acres of brush and no water, one hundred acres of pickleweed and too much water: this pretty well describes the Robert Blohm farm as it was 10 years ago. Hardly an acre of the hill land was not covered by dense brush, scrub oak, greasewood, manzanita and poison oak.

Today, tall fescue, perennial ryegrass, and subterranean clover with many annual grasses, replace the brush on about 500 acres of the steep slopes. Where there was chaparral, 75 head of fat Hereford cattle now graze on lush grasses and there is room for still more.

Pickleweed of the salt water marsh has yielded to tall fescue, ryegrass, and birdsfoot trefoil.

This is not a spectacular overnight development, but a well planned, long range program. Brush is cleared and grass seeded at a minimum of cash outlay and a little help from technicians.

Blohm is president of the board of directors of the Elkhorn Soil Conservation District in Monterey County, Calif. He is well aware of the hazards of clearing steep, sandy soil. Simply clearing the land and seeding grass is not quite enough. The brush and bracken ferns reappear if the land is not properly handled immediately afterward. It must be disked the first summer. Herein lies danger. Soil left clean-tilled is open to erosion in the fall.

To overcome the threat of erosion, Blohm is careful to disk across the slope. He leaves on the surface a mulch of leaves, small branches

Blohm surveys results.

Note.—The author is soil conservation aid, Soil Conservation Service, Watsonville, Calif.

Realignment of the Elkhorn Road with earth fill across the Elkhorn Slough made possible the drainage of several hundred acres of salt-contaminated land.

and chopped up ferns. No large area is cleared at one time. There is always a buffer strip left for protection. Using these practices, erosion has been almost nil. Clearing is done with a tractor equipped with bulldozer. Oak trees too large to be taken out readily with this light rig are left for shade. Blohm says the land where manzanita grows is very poor and grass does not do well, so no manzanita land is cleared for the purpose of range seeding. He has sold, however, many cords of manzanita root for the manufacture of smoking pipes.

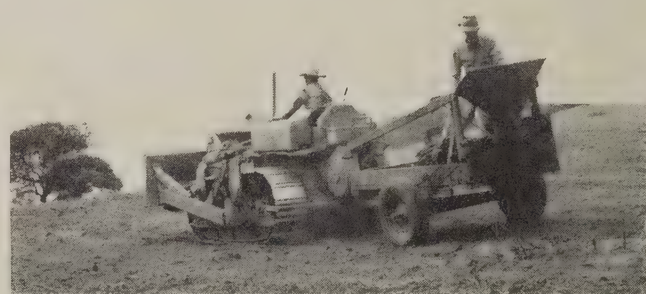
For stock water, 10 small dams were thrown up with the bulldozer at small cost. These were built in canyons, and filled by winter runoff and summer seepage.

Ever resourceful, Blohm in one instance even took advantage of a county road fill: During construction of the road, which forms the southern boundary of his farm, he prevailed upon the county to place a culvert high enough up in the fill to act as a spillway! With a little extra earth placed against the road fill, an inexpensive stock water reservoir was the result. By proper fencing, this was made to serve two fields. Another pond was fenced off to provide water for stock from three fields.

Each canyon was fenced so that the ranch would be divided into 13 separate fields. Blohm is a firm believer in rotation grazing and says he has strung 50 miles of barbed wire to accomplish this end.

Much of the romance of cowpunching has been taken out of Blohm's ranch operations. Instead of donning chaps, spurs and ten-gallon hat, and mounting a mustang to chase his cattle into a new field, he merely drives up to the gate in his red pickup, honks the horn and waits for the cattle to come to him. They always do. They have learned that that horn means new lush grass.

No part of the range is overgrazed. Blohm says, "I would rather have too few cattle and too much grass than too little grass and too many cows." In fact, the range is considerably undergrazed; hence, ripgut is coming in. But Blohm is not greatly disturbed. The ripgut is not in abundance and it will be controlled by early season grazing when the range is fully stocked. He says that ripgut is good feed when young, and later in the season when



Robert Blohm drives while Lew Hands, soil conservationist, tends the seeder. Five hundred acres of this land, formerly in brush, has been seeded. Trashy tillage protects from erosion.

wet. His cattle spend the night and early morning on the hill range where they graze on seeded perennials and the ripgut, if the latter is wet from fog or dew. They seek the slough range during the day, where they get their daily quota of salt. No salt bricks are needed. The Pacific Ocean, via Monterey Bay and Elkhorn Slough, provides the salt naturally.

Now about that hundred acres of salty sloughland. Blohm's 100 acres are only a small part of the Elkhorn Slough. Actually, the slough covers several thousand acres extending from Monterey Bay, at Moss Landing, to several miles up the Carneros Creek drainageway. It is formed by tidewater from the ocean.

When the county realigned the Elkhorn Road it did away with the old Elkhorn Bridge and made an earth fill across the slough. The Moss Landing Harbor Board, a wide-awake group, saw an opportunity to help their own facilities; therefore, it furnished tide gates to be placed in culverts through the road fill. This made possible the drainage of Blohm's 100 acres, as well as several other pieces of neighboring sloughland.

The tide gates permit the fresh water of Carneros Creek, and floodwater from winter rains, to pass on out to the ocean some 4 miles away. They also prevent the sea water from flooding the land at high tide. Blohm was quick to take advantage of his opportunity. He got help from Soil Conservation Service technicians. The technicians found over 3 percent salt in areas where pickleweed was abundant, and only 0.24 percent salt on the hummocks within the slough area where some annual ryegrass was growing. Besides drainage, there remained the problem of leaching out the salt. Blohm chose the simplest and cheapest way, although not necessarily the quickest and surest. He simply plowed the land deeply, turning it over in great ribbons of pickleweed sod, and then waited for flooding by winter rains and Carneros Creek to do the leaching. Deep dead furrows were left for drainage ditches.

But Blohm got no breaks from the elements. The last two winters have been mild, so no flooding has taken place. Even so, there has been some leaching as areas of pickleweed that were worked a little and seeded are producing well.

In the slough, Blohm seeded birdsfoot trefoil, 3 pounds per acre; ryegrass, 4 pounds per acre; alta fescue, 4 pounds per acre; and strawberry clover, 2 pounds per acre. There is little evidence of the strawberry clover, but the other varieties look fine.

The hill range was seeded to subterranean clover, 4 pounds per acre; rose clover, 4 pounds per acre; ryegrass, 4 pounds per acre; and tall fescue, 4 pounds per acre. Subterranean clover is spreading to areas not seeded and is otherwise showing great promise. In the past, a number of different varieties of grasses and legumes have been tried, but the mix recommended by SCS conservationists, now used, has proved the best.

After selling off some 400 acres of brushland, Blohm has 700 acres upon which, at present, he runs 75 head of grown stock. He figures on ending up with an even 100 head. This is 7 acres per head, in contrast to the average hill range in this area requiring 15 to 20 acres per head.

CONSERVATION BY HOSPITAL.—The value of soil conservation is well demonstrated on the Danvers (Mass.) State Hospital farm. Practically all of the 560 acres have been "tied down" through the establishment and regular maintenance of soil conserving practices. Due to the heavy demand for crop production and the wide variation of soil types, 29 of the 34 conservation practices recommended by the Essex Soil Conservation District for use in the county have been used. These practices make it possible to meet the heavy yearly demand for production of 65 acres of row crops, hay for a herd of 125 registered Holstein cattle, and pasturage for young stock and some 500 hogs. About 40 acres of the farm are in permanent woodland. The fact that conservation has paid on this farm is evident throughout and to all who have followed its development.

—ROGER C. WILLIAMS.

DROWNING TOPSOIL.—Recently the depth of silt in Lake Benton, Minn., was measured. Early records show that this prairie lake of 2,600 acres was from 15 to 24 feet deep. Now, silt from 5 to 15 feet deep has filled it until the lake is only 7 to 9 feet deep.

This silt, it is pointed out, was once topsoil. It was washed and blown into the lake from surrounding cropland. Future crop production thus is affected, and also the fish population.

By HERBERT I. JONES

William B. Aiken, Arthur Anderson, Alex Martin, Clyde Hutchins, and Oscar Land.

Tackling the Problem of Underground Seepage

Tom Kidd, technician, locates water-bearing stratum 10 feet down with this power machine.

WHEN I told Art Anderson, Fort Collins, Colo., Soil Conservation Service representative, that I "just couldn't see it!" Art replied: "That's the point, neither can anyone else. Consequently, we spend a lot of time and effort investigating every drainage job."

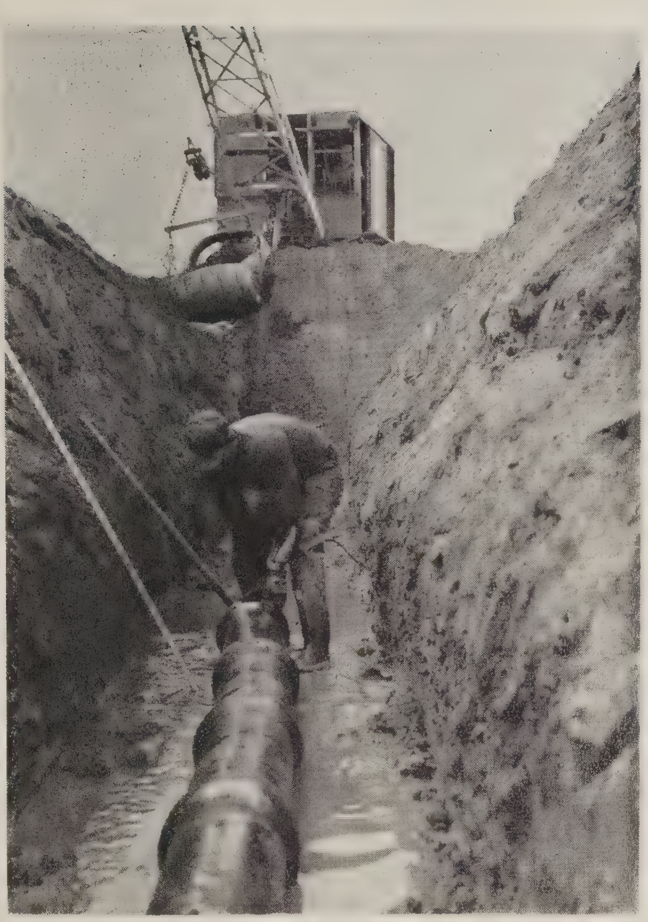
This was my introduction to the serious problem of underground seepage that yearly robs Colorado farmers of untold acres. Often it reaches the point where the accumulating salts grow thick and caustic on the surface. The site of alkali beds in the midst of productive farmland has become an all too familiar sight to all of us, but not so the reasons for them nor their cure.

Note.—The author is work unit conservationist, Soil Conservation Service, Littleton, Colo. This article is based on an article which originally appeared in *Western Farm Life*.

"You see," Art went on, "water moving underground through porous layers of the earth eventually comes to the surface or close to it. Evaporation leaves behind salts that finally become so concentrated they kill ordinary farm crops. The salts may even turn into forms that will completely change soil structure."

Art and Clem Dodson, soils expert attached to the Fort Collins Soil Conservation District,

Deep, accurate setting is the rule. Trenches here are 12 feet deep.



Careful setting of tile is necessary, due to flat grade.

further initiated me in this problem as we drove out to one of the spring jobs.

Southeast of Timnath, I met the three "young fellas" who I had been told were "doing something about it!" One was William Aiken, 91 years old, homesteader, salty as they come. His two partners on this job are Oscar Land, and Alex Martin, Jr.

I was immediately impressed by the confidence these men had in each other. And even more, perhaps, by the confidence they had in the Soil Conservation Service people, Art, Clem, and the engineer, Clyde Hutchins, right hand man of the planning and soils man.

While we looked over the work, and work it is, running thousands of feet of tile drain line at depths up to 14 feet, I questioned Oscar Land as to how he knew he wanted the job the way it was planned. He told me he didn't really know he wanted it that way, but he had confidence in the skill of the technicians, who had bored hundreds of holes to inventory the underground water. If they said the location was right—that was good enough for him. Confidence in the technical help was further brought out when I learned one of the contractors wanted to change design in some details, but Aiken, Oscar and Alex refused to consider any deviation from Hutchins' plans.

All this began in 1947 when Oscar Land tired of wasting between 30 and 40 acres to subsurface water. This acreage had never grown a crop in the 12 years he had farmed the Yancey Place. Oscar went to the Fort Collins Soil Conservation District office and explained the problem to Art Anderson. A preliminary investigation of the farm showed no possible way of disposing of the water even if it could be successfully intercepted. Oscar went ahead for several years with other conservation jobs that he and Art had planned but he always hung onto the thought of licking that underground water.

Later, in 1948 to be exact, Alex Martin started talking drainage. Art realized that if the Martin drain were set low enough and were

Plenty of gravel and coarse sand envelops all tile.

big enough, it could carry the water from the Yancey land and from the Aiken land, in addition to picking up the subwater from Martin's own 75 wet and wasted acres. Everybody would benefit!

After it was pointed out how their common problem could be solved, the three neighbors who scarcely knew one another got together with the help of Art Anderson to beat the

(Continued on page 134)

Dr. Otto R. Younge, agronomist, University of Hawaii, used mike to tell about conservation practices at Poamoho Experiment Station.

Association officers: Jitsuo Teruya, secretary-treasurer; Alfred Alu, vice president from Maui; E. C. S. Crabbe, Jr., vice president from Kauai; Edward Hiroki, president; Desmond Fletcher, first vice president, Oahu; Norman McGuire, vice president from Molokai; Herbert Shipman, vice president from Hawaii Island.

Edward Hiroki, first president of the Hawaii association, flanked by Waters S. Davis, Jr., president of the National association, and Alan Thistle, executive officer of the Territorial Soil Conservation Committee.

Hail, Hawaii!

By ROBERT E. SWANSON and WARREN S. IKEDA

FARMERS and ranchers in the Hawaiian Islands recently organized the Hawaii Association of Soil Conservation Districts—the 50th association of its kind under the American flag.

Time of launching was in September, during a 2-day field tour and conference sponsored by the 13 districts and the Territorial Soil Conservation Committee.

Forty-one directors of Hawaii's districts attended the field tour in rural Oahu, together with a hundred farmers and ranchers, representatives of pineapple and sugar plantations, equipment companies, and Federal and Territorial agencies.

Waters S. Davis, Jr., president of the National Association of Soil Conservation Dis-

Note.—The authors are, respectively, soil conservationist and soil scientist, Soil Conservation Service, Oahu and Wahiawa, T. H.

Dr. Younge explains effectiveness of conservation practices in use.

Directors of Hawaii's 13 soil conservation districts get together for a group picture during tour.

tricts, had a share in the event. His visit to the Islands came at the request of Edward Hiroki, chairman of the South Oahu Soil Conservation District. Hiroki was elected president of the new association.

The first day of the conference was devoted to an inspection of this beautiful tropical island, with particular attention to pineapple fields, truck farms, the University of Hawaii Experiment Station, Waialua High School, and the Kualoa Ranch. Cooperators with the West Oahu and Koolau Soil Conservation Districts were on hand to tell the story of their conversion to save-the-soil farming methods.

Here are some of the crops and practices that were seen during the day: Pineapple fields mulched with 40 to 60 tons of "trash" to the acre; half-mile-long waterways sodded with Pensacola Bahia grass; an alfalfa field from which 11 cuttings have been taken a year; a 500-acre planting of Guinea grass for pasture; a guava orchard mulched with cut Napier grass; and windbreaks of shrubby Hibiscus, the official flower of the Territory.

At the second day's conference, in Honolulu, the directors and their guests heard Samuel Wilder King, governor of Hawaii; Waters Davis, Jr.; Alan Thistle, executive officer of the Territorial Committee; and Tom F. McGourin, acting territorial conservationist, talk about the land problems of Hawaii and the Nation.

After the directors reviewed and adopted their articles of association and chose Edward Hiroki as first association president, they elected five vice-presidents, each representing a major island: E. C. S. Crabbe, Jr., Kauai; Desmond Fletcher, Oahu; Norman McGuire, Molokai; Alfred Alu, Maui; and Herbert C. Shipman, Hawaii. Jitsuo Teruya of Oahu was appointed secretary-treasurer.

Thus, another step was taken toward permanent conservation in the colorful, tropical Hawaiian Islands.

George Shimizu and Samuel Kamakau, knee-deep in sugarcane-trash mulch used to combat erosion and weeds in papaya orchard.

UNDERGROUND SEEPAGE

(Continued from page 131)

underworld. A modern revival of the "log raising" of colonial times!

Land and Aiken are paying the extra cost of laying the Martin line deep and the extra cost of using big tile to carry all the water. The 1,600 feet of line being installed in 1954 is all on the Martin land. The group is organized by written agreement and has met frequently to consult the conservationists and to settle common problems. Meetings and plans are continuing as the group readies itself to install 7,500 feet of remaining drainage line during the winter of 1954-55. With the Martin work nearly completed, the Yancey-Land job can begin. Upon the completion of the job for Oscar Land, actual work on the 3,900 feet of line on the Aiken land can be started.

Several of the construction features are novel. Cemented gravel dikes were encountered at depths of 8 to 10 feet, and often another 2 or 3 feet of earth had yet to be removed. Dynamite was loaded in holes drilled in the rock and the trench filled back with loose dirt. After the dynamite was set off, shattering the rock ledge, the entire ditch was redug to the required depth.

We stood and watched huge draglines bite into the earth to the depth of 13 feet. As the tile pipe was deftly lowered it was laid close behind the digger with the joints snug but uncemented. The bed under the tile was made firm by tramping gravel into the soupy earth. Over the tile, and especially at the joints, an envelope of gravel was set to encourage the water to enter the pipe joints. The tile was graded with a fall of 1 inch in 5 feet, a variation of less than a quarter of an inch in 1 foot!

While all of this is costing the three farmers several thousand dollars, they expect to repay the cost in future years with crops off the land previously affected by salt and the high water table. The cost isn't over yet by a long way! Branch lines to hook on the main lines to benefit other parts of their farm may be planned in years to come. How effective is the work? Martin's shallow well in the feed lot went dry 2 months after work began!

Together these men farm 520 acres of land devoted mostly to sugar beets, alfalfa, corn and barley. These productive crops catch the eye of every visitor the minute they strike the fertile irrigated lands of Colorado. Most of the hay and grain is fed to cattle and sheep.

As the damaging subwater flows away and drains the surface soil, the three farmers will begin their program of soil reclamation by using plenty of manure and by plowing under as much stubble and other organic matter as possible. As this job progresses they may add some gypsum and sulphur soil amendments. Clover, sugar beets, and grain will stand fairly high amounts of alkali salts, so it is hoped that fair production can be obtained from even the worst damaged soils. All in all, immediate benefits of the job will be felt on 75 acres on each of the Aiken and Martin farms, and possibly as much as 100 acres on the Land-Yancey farm.

Oscar Land's parting remark was the thing I remember best: "So many of these underground drainage jobs are really unnecessary! If farmers would keep constant control of their water, would eliminate runoff, and wild flooding, and get together to line ditches and stop water waste, the water saved could do good to producing crops instead of injury to lower lands!"

LONG-LASTING GIFT.—The Barnwell (S. C.) Soil Conservation District recently presented $100 worth of conservation literature to the Barnwell County Library. The accompanying picture, taken by the McDonald Photo Service, shows district supervisiors Leon W. Lott and Algie M. Grubbs with librarian Mrs. Peter Stabovitch. They are looking at the new acquisition.

Drainage in the Big Horn Basin

Seepage creates special problems on many irrigated farms in the valleys of Wyoming.

Poor irrigation causes problems. These are cleared up by proper preparation of the land and control of irrigation water. The field at the left has been smoothed to a uniform, gentle slope. Laterals are correctly spaced so that the runs of water between them are not too long. At the right is a field that is uneven. About a quarter of this field is properly irrigated, about a quarter is under-irrigated because it is too high, and half of it is over-irrigated. The excess of water soaking into the ground helps raise the water table.

By C. KEITH MILLER

IN many irrigated areas of Wyoming and other states a considerable amount of land becomes seeped soon after irrigation water is applied. Ordinarily, seepage occurs on the lower portions of the farm and it usually increases yearly in size until, in some instances, an entire farm has been enveloped. In fact, seepage has become so critical in places that large portions of an irrigation project, including many entire farms, have been practically destroyed for purposes of cash-crop production.

A high water table is not always harmful to the land. But when there is also heavy evaporation, "salt" accumulations concentrate on or near the surface of the ground. Because of heavy salt concentration in the topsoil, much of the seeped land becomes toxic and only the most salt-tolerant plants will survive and grow. Eventually, entire fields become sterile and all we see are snow-white patches poking their faces out from amongst a few scattered salt-tolerant weeds.

Note.—The author is area conservationist, Soil Conservation Service, Worland, Wyo.

Usually, as the seeped acreage becomes more and more unproductive, the land operators attempt some kind of a drainage program. In the past many such drainage systems have proved unsatisfactory because of a lack of basic information about the soil and ground water conditions.

There is no single solution to all the drainage problems on irrigated land. Drainage practices and installations are just as complex as the establishment of good irrigation practices. They must meet the requirements of all of the various soil types, both surface and underground, which are present in areas considered for water application.

The Soil Conservation Service has found, in many soil conservation districts where it is working, that seepage is one of the serious problems standing in the way of improving conditions on irrigated lands. About 8 years ago the Service determined to do some special work in drainage in the Greybull Valley Soil Conservation District of Wyoming, as well as in a number of other soil conservation districts in the Big Horn River Valley.

There was a great deal of literature on drainage studies and on field investigations in non-irrigated sections of the country, but much of the information had little application to the semi-arid, irrigated valleys of Wyoming. Information on local conditions was necessary before a sound drainage program could be started. Field investigations, therefore, were undertaken on each farm or group of farms requesting technical assistance.

A geologist of the Service was assigned to drainage studies in the area, and it was his job to mobilize all pertinent information relating to soil, ground water, geology, and topography. During the first year of his assignment, investigations were made on a large number of farms in a number of soil conservation districts in the Big Horn River Valley.

In the early stages of the investigations, hundreds of existing drains were examined in order to learn why most of them were failures and why a few were partially or completely successful. The next step was to examine seepage sources or causes, such as leaking canals, reservoirs, irrigation practices, natural seepage, and improper land use. Thousands of soil borings were made in and around problem areas in order to determine the soil and water relationship. The information obtained included the type and thickness of soil and subsoil layers, the permeability of soil and subsoil at various depths, the depth to water table or tables (if perched tables were encountered), and the depth to barriers, such as hardpan, clay or bedrock. All soil borings were drilled to depths of as much as 16 feet. Often, even such depths were insufficient for necessary information, in which event all the well logs in the immediate vicinity were checked and the data correlated. This data furnished cross-sectional information which was extremely valuable in later studies, especially in group drainage projects where entire valleys had to be taken into consideration.

After about a year of field investigations, it became evident that drainage under local conditions was a varied and complicated procedure. One farm unit might have as many as four different types of seepage, caused by poor irrigation practices or methods, leaking canals and ditches, a natural high water table condition, and poor water use by a neighboring farmer.

The first successful drainage in cooperation with the soil conservation districts was based on these drainage studies. The systems were oriented, in accordance with the findings of the investigations, and placed at the correct depth and in soils and subsoils that were permeable but still stable enough to prevent sloughing.

Field observations and examinations indicate that generally open ditches do not work properly in deep silty or sandy soils. That is because sloughing of the side slopes takes place during or soon after excavation. As a result, the sloughed materials not only block the grade of the drain, but also eliminate part of the original depth, creating slow velocities and

"Just across the road." The grainfield at the left has proper drainage. The drain is at the break of the slope in the background; it intercepts the flow of ground water. At the right are foxtail, watergrass and other vegetation that accompany a salt-bearing, high water table. The drain for the latter field runs parallel to the flow of ground water and therefore has little or no effect on the water table of this field.

Two views of drainage ditch 18 months apart. That at left was made soon after construction. Note the flow of water. The picture at the right shows the same ditch a year and a half later. There is still a strong flow. This is one of the drains on the Emblem bench.

standing pools of water. Tile drainage does not generally work efficiently in deep silty or sandy soils unless the tiles are protected or supported. For example, tile lines in deep sandy soils will bow and sag unless supported with wood, gravel packing or other means, and if straight tile (drainpipe) is used and joints are not partially wrapped, silt and sand will choke up the drain, rendering it useless.

Subsurface draining of the land is not always the best answer to the seep or alkali problem. If the land can be improved by simpler and cheaper methods, recommendations are made accordingly. For example, if the causes of seep are due to faulty or poor irrigation practices (too much water), long runs in the fields and leaking canals, elimination of the recharge sources may make drainage unnecessary. With the elimination of one or more of the recharge sources, the water table is often lowered to a point where adapted crops can be grown.

There are some lands that cannot be drained or where drainage is economically impractical. In these cases the only alternative left is careful water use and the elimination of possible recharge, with good control over waste water.

As mentioned previously, the basic information sought in drainage investigations is the relationship of soil, subsoil, ground water, geology, and topography. Once these facts are gathered and correlated, drainage can be determined as possible and practical, or possible but impractical. Many times, the conditions are such that even though the land can be drained, the cost of drainage systems exceeds the value of the land benefited. It is practically impossible to drain raw shaly soils underlain with shale bedrock. Heavy water applications on these soils are more damaging than beneficial. This is because of the great salt content, not only in the soils but also in the parent materials below.

Some of the most successful applications of this drainage procedure have been in the Greybull Valley Soil Conservation District. In this district, individuals and groups, in cooperation with the district, have installed approximately 36 miles of open drain systems averaging approximately 7 feet in depth and 19 miles of tile drains. These systems have improved over 9,800 acres of cropland.

Soil Conservation Service geologists working with the conservationists and engineers of the Service, located and oriented the systems. The conservationists and engineers carried out details of planning and staking, and supervised construction of the systems. Fields that were too wet to get equipment in before drainage was installed grew good barley crops the first year after drainage. Several farmers have

been heard to say, "I've got the best drain in the Big Horn Basin."

The Emblem Bench, west of Greybull, was settled some 35 years ago under the Carey Act and irrigated with water furnished by the Bench Canal Company.

Within this area there are 12 operating units with a total of 1,869 acres that were severely affected by seepage. The landowners concerned wanted to do something about their problem. They presented it to their board of district supervisors. It was determined that the best way to do what they felt was needed was for the interested landowners to organize themselves into an informal group to be known as the Emblem Enterprise Drainage Group. It was agreed that the landowners would pay all costs of construction if the Service would furnish the technical assistance on planning. An agreement covering all of these matters was drawn up between the Soil Conservation Service and the soil conservation district.

Technicians then applied themselves to this particular problem and determined to make it an example for an attack on similar drainage problems. First, a complete survey, including topography, ground water, and geological formations, was made. Second, the land use capabilities were determined. Third, cost estimates of the drainage systems were prepared. Suitable outlets were located and rights-of-way obtained from all persons, places, and agencies concerned. The original main drain ditch is 15,279 feet long, emptying into a natural channel into Dry Creek, a tributary of the Big Horn River.

The main ditch is about 30 feet wide at the top and from 7 to 8 feet deep, with slopes of 1½ to 1 for the particular local geological conditions of surface soil type and underlying gravel.

The drains were completed in 1947 and have worked so successfully that the water table has been lowered on far more than the originally estimated 1,869 acres, extending beyond the property lines of many of the farms.

One of the men located in the district, Christ Simon, a cooperator, took the leadership in getting his neighbors together so as to do something about the wet lands. He was the driving force in calling the meeting and in assisting technicians and district supervisors. The group consisted of the Bench Canal Company, the State Highway Department, the Big Horn County Commissioners, the Greybull Valley Soil Conservation District, the Soil Conservation Service, and the landowners.

The Simon farm was typical. In the summer of 1945, less than 12 of the 160 acres in it were dry. A root cellar in Simon's backyard had water up to within a couple of feet from the top. All of the land around his buildings and practically every acre of his farm was white with salt.

Simon applied for assistance from his soil conservation district shortly after he had bought the farm in 1945. That year, it was almost impossible for him to prepare a satisfactory seedbed. The water was coming into his land as a result of underground seepage through a gravel subsoil. In 1946, Simon's crops were almost a complete failure. Even with the high prices, he received less for his poor crops than it cost to operate. The drain was completed early in 1947, and his 1947 crop showed marked improvement. Simon's drainage system cost $18 per acre, which was his part of the cost of the main ditch and supplementary ditches installed on his land.

By 1948 Simon's land dried out sufficiently for him to plan his farm with the assistance of the Service farm planner, and start off with a complete set of rotations. At present his pasture soils are firm, all fields have lost their white luster, and he is cultivating and producing crops on every field of his farm. His beans average over 1,500 pounds per acre. The family has excellent strawberries and a fine garden.

In 1946 and 1947, the Simons were able to raise very little garden products. Today, the root cellar is dry and the shelves are loaded with canned foodstuffs. Their yard has lost its white color; it is dry and rapidly acquiring a good grass cover.

Simon planted a shelterbelt around his buildings in 1948, and the trees are doing very well. Recently, in discussing the improvement in the farm, he said: "The fruit trees which I recently planted are looking fine, whereas in

1946 they just couldn't make a go of it. One thing I like about this method of drainage installation is that when I paid the $18 an acre to have the job done, I was through—I don't have a lot of long-time payments with a lot of interest and assessments to look forward to."

Mrs. Simon commented on her excellent string beans, her cucumbers, and tomatoes, raised since 1948. Before that time her garden produced practically nothing.

This is about the same story told on each of the other 10 farms.

We may not have a solution to the entire drainage program in Wyoming, or in our Valley, but we do know that the Enterprise drain is an example of what has been accomplished on over 10,000 acres in the Big Horn Valley during the last couple of years. With further investigations, we are certain that we will find that many other apparently unsolved drainage problems can be whipped. Eventually, we hope to return many more thousands of acres of high-quality mountain valley irrigated land to high production.

Modern Planning Guides Martin and Sons

This leading farmer of Mississippi was a local pioneer in establishing improved pastures and in making maximum use of his timber resources. He and his sons have their large acreage under soil and water conservation, and invoke all the technical assistance available.

By R. C. FLANAGAN

"PLAN before you marry, plan before you plant." That's a good slogan on both counts, says Roy R. Martin, commissioner of the Rankin County (Miss.) Soil Conservation District.

Martin and three sons, Ralph, James, and Rupert, all of them veterans, began planning before marriage. Each son followed his father's example with a wedding on their sire's anniversary, December 27.

Today, Martin and his sons own 3,845 acres of land, which are under a complete soil and water conservation plan. Each son owns his own home and 400 acres of land. Ralph's operation is a separate one, while James, Rupert and the elder Martin have a joint enterprise.

Originally Roy Martin was a row crop farmer. He began in 1918 with 157 acres. Present cotton acreage is 70. There are 25 acres in corn, 110 acres in oats, and 85 acres in lespedeza. Improved varieties of oats are used with lespedeza in rotation with row crops.

Terraces with adequate waterways have been established on sloping cropland, while drainage facilities, including "V" and "W" ditches, have been installed on flat, wet areas. Contour farming, with the use of wild winter peas or vetch, is practiced each year.

In addition to building his cropland through rotation, Martin uses basic slag and legumes and anhydrous ammonia on corn, cotton, and oats. The 30 acres of lespedeza sericea on Class VI land are used entirely for supplementary grazing. A quarter of a mile of once-eroded roadside is now wrapped up with kudzu.

Martin also believes in the conservation of wildlife. Evidence of this fact is a lespedeza bicolor border which separates his cropland from a wooded area.

Livestock graze the lush pastures where plants are selected to suit the soil. The herds include 100 head of breeding beef cows, 100 head of steers, 100 feeder hogs, and 340 sheep. J. G. Payne, work unit conservationist, works closely

Note.—The author is area conservationist, Soil Conservation Service, Jackson, Miss.

with the Martins in developing a grazing program. Combinations of Pensacola bahia, bermudagrass, lespedeza, wild winter peas, and crimson clover are favored.

Wild winter peas go on the wet areas, while crimson clover is confined to the higher slopes. Dallis grass and white dutch clover are planted on the more level lands, whereas fescue and ladino are put on the flat wet areas classed as II and III lands.

Of the 500 acres of improved pasture, approximately 200 acres once were in woodland covered with blackjack. All fields are limed and fertilized in accordance with soil tests. The remaining acreage comes from idle land or has been from row crops.

Martin was one of the first farmers in the Rankin County Soil Conservation District to establish an improved pasture, starting with 10 acres in the fall of 1942. In the past 5 years, additional acres of improved pasture have gone in each year, totaling 500 acres at the present time. Most of the pastures have started with oats and ryegrass used as a nurse crop. Another essential in the land use pattern is water, which has been provided for by the construction of six well-spaced ponds and with the use of live streams fed by springs.

"In 1920 I sold enough timber from the original 157-acre tract to clear it of all indebtedness. That gave me an idea as to the value of timber in my farming operations," Martin says.

The first practice in the timber area was the construction of fire lanes, which served later as

The Martins plant more than 100 acres of oats for feed. This stand yielded more than 60 bushels per acre for James and Rupert Martin, seen here.

District Commissioner Roy Martin inspecting a field border of lespedeza bicolor which also provides food and cover for wildlife.

roads for logging operations. These fire lanes were laid out with the use of a soil survey map. They were located either on the ridge or on contour. A fire lane surrounds each 400 acres or less, where needed, depending on physical features. A total of 28 miles of fire lanes now has been constructed.

In 1949 Martin began "release and selective cutting." He was high in his praise of the assistance rendered him on these jobs by representatives of the Mississippi Forest Service, as well as other agricultural agencies.

A total of 736,000 board feet of pine timber and 320,000 board feet of hardwood has been cut on 1,300 acres since 1949. In addition to this, the tops of the pinetrees were cut into pulpwood and marketed on a truck or carload basis.

In the woodland improvement program, the work of nature was helped by the removal of 8,000 posts from overstocked areas. The posts were treated and used on the farm.

In many areas—approximately 185 acres—there were insufficient seed trees for natural reproduction of pine seedlings. Here Martin has planted a total of 185,000 seedlings, most of which were mechanically set.

Martin and his sons are practicing selective cutting on the entire 3,000 acres of woodland. They have made plans to divide their woodland area into 5 parts in order to establish a 5-year selective cutting cycle.

Roy Martin and his three sons, all college graduates, have proved that it pays to set up a conservation plan and then follow that plan, using all available technical assistance.

WOMAN OF THE YEAR.—The Golden Business and Professional Women's Club has chosen as its woman of the year for 1954 a modest and tireless educator, Mrs. Marguerite Juchem of Arvada, Colo. Since 1948, Mrs. Juchem has been a consultant in secondary education in the Colorado State Department, and has dedicated her life to the betterment of education.

Conservation education has been one of Mrs. Juchem's strong interests. She has worked with both educational and other agencies to promote the program in the schools of the state. She has been a member of the education committee of the Colorado Association of Soil Conservation Districts and has served on a committee of 11 persons who have been working on a coordinated conservation program for state agencies concerned with conservation.

In 1950, Mrs. Juchem was appointed by Governor Dan Thornton to the committee for the employment of the handicapped, and in 1953, to the State Board of Standards for Child Care. She is a member of the Colorado Council on High School and College Relations. During 1953-1954 she was a member of the Colorado Education Association's adult education committee, and in 1947 was chairman of the advisory committee on school health.

The safety of Colorado youth has been Mrs. Juchem's constant concern. She was general chairman of a group which produced *Highways to Health and Safety*, and has compiled a set of rules and regulations for school bus operation. In 1950, Governor Thornton appointed her deputy state director of Civil Defense Education, and in 1951, General Larsen, Civil Defense Director, sent her to Staff College at Olney, Md., to assist in setting up a civil defense program for the nation's schools.

Clifton L. Etter, SCS man, and M. C. McCormick appraise the sand lovegrass that provides grazing for Herefords

Out of Drought, A Lesson

Rains help, but so do sound conservation measures. This veteran of many dry years has faith in the future.

By VIRGIL S. BECK

YOU can't lick the dust bowl with wheat alone, says M. C. McCormick, who is carrying on a diversified enterprise on 3,700 acres 5 miles southeast of Holly, Colo. McCormick and his father came to Prowers County in 1920. He was here when the dust was blowing in the thirties. Out of his long experience in a dryland, he concludes that farmers ought not to try to cultivate marginal land if they wish to stop the blowing of the soil.

"A farmer cannot stay in business on only one good wheat crop every 4 or 5 years," he states. "The only solution I can see is to put the critical areas back to grass and grow feed crops instead of wheat on the cultivated land. If everyone would work toward such a solution, we eventually could lick this dust bowl problem. Of course, a few good rains would help."

On his 1,804-acre home place, McCormick has a small irrigation well, the first to be drilled in this area south of the Arkansas River. From it he irrigates 16 acres of alfalfa and 24 acres of feed crops.

A married son—M. C., Jr.—lives on a 320-acre tract purchased 4 years ago. This tract, too, was destined to have its thirst quenched.

Sought for the production of supplemental feed, water came in at 109 feet from a well that pumps 1,800 gallons a minute. The well irrigates 140 of the 320 acres, while 160 acres are dry farmed and 20 acres are in dryland grass.

McCormick has 250 Hereford cows and calves. He is in partnership with his two sons each of whom owns 25 Herefords.

Richard is a 17-year-old junior in the Holly High School. He belongs to a 4-H Club and the Future Farmers of America. Last year he showed the championship steer at the Prowers County Fair. In addition, he was named "Boy of the Week," and won numerous other awards. This year, he will enter both a Hereford and Aberdeen-Angus steer in the competition.

McCormick got a 98-percent calf crop this year, the best in a long while. Calves sell in the fall at around 400 pounds. He grows all of his feed except cottonseed cake, which is fed during the winter. He now plans to grow soybeans as a substitute for the cottonseed cake.

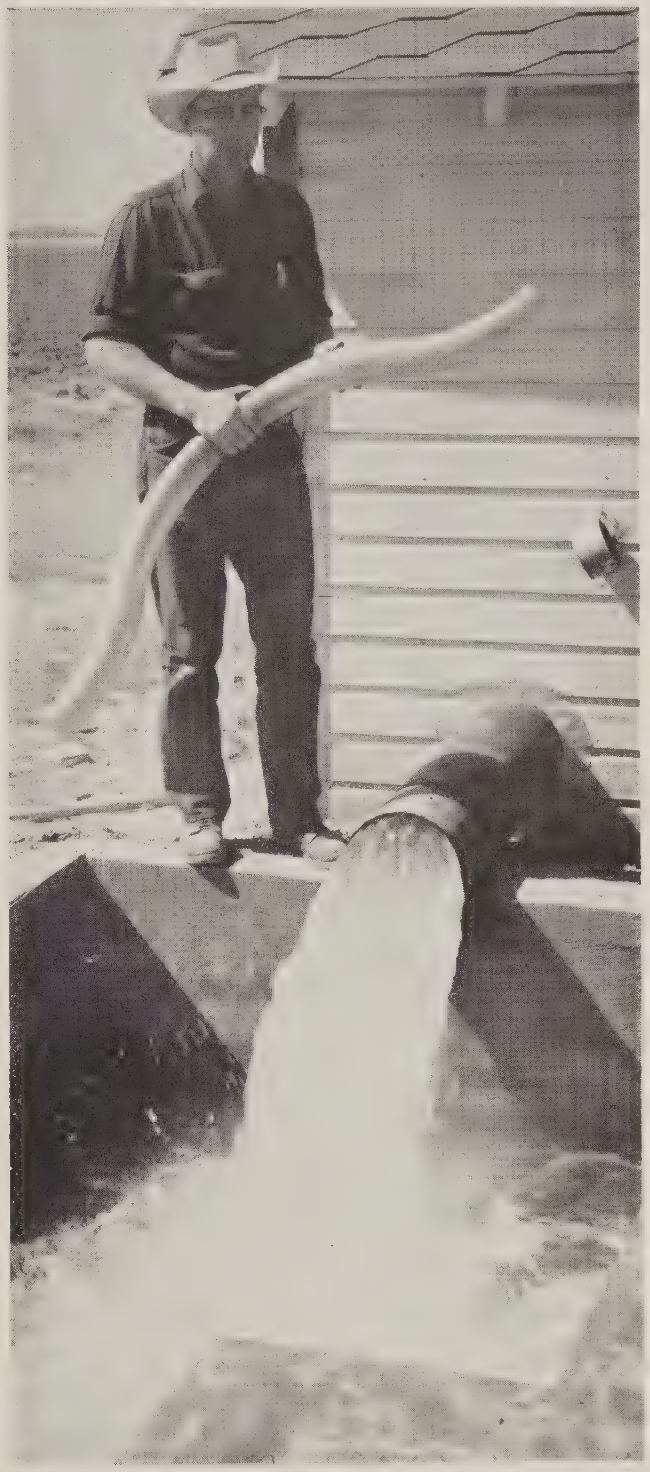
McCormick, who has been cooperating with the Northeast Prowers Soil Conservation District for the last 3 years, follows a program which provides for 320 acres in wheat, 320 acres in fallow for wheat, and 300 acres in grain sorghums for feed.

The last 4 years have been very dry, but McCormick finds his conservation of soil and water paying off. Last year was so dry that only fair crops were produced; however, he did get some 18 bushels of dryland wheat per acre. His irrigated feed crops were very good on the 140-acre tract, and he produced around 300 tons of silage which was stored in a trench silo, plus 500 tons of bundle feed. He still has around 50 to 60 tons of ensilage left.

In 1950 an old cultivated field of 30 acres, was blowing severly. McCormick decided to try to stabilize it by seeding sand lovegrass. An excellent stand resulted, and blowing has been eliminated completely.

"This old field now is furnishing such excellent grazing that my cattle have been breaking through the fence to reach it," McCormick reports. In addition to the grazing last year, the field was good for 500 pounds of clean seed. The seed is useful in planting other areas on his farm. Some overseeding of sparse stands of native sandhill range was done in 1951 and the results have been encouraging.

Soil blowing recently caused McCormick some trouble. There has been such damage even on some of the land on which he left high ungrazed sorghum stubble. Most of it traced back, however, to dirt caught from other unprotected



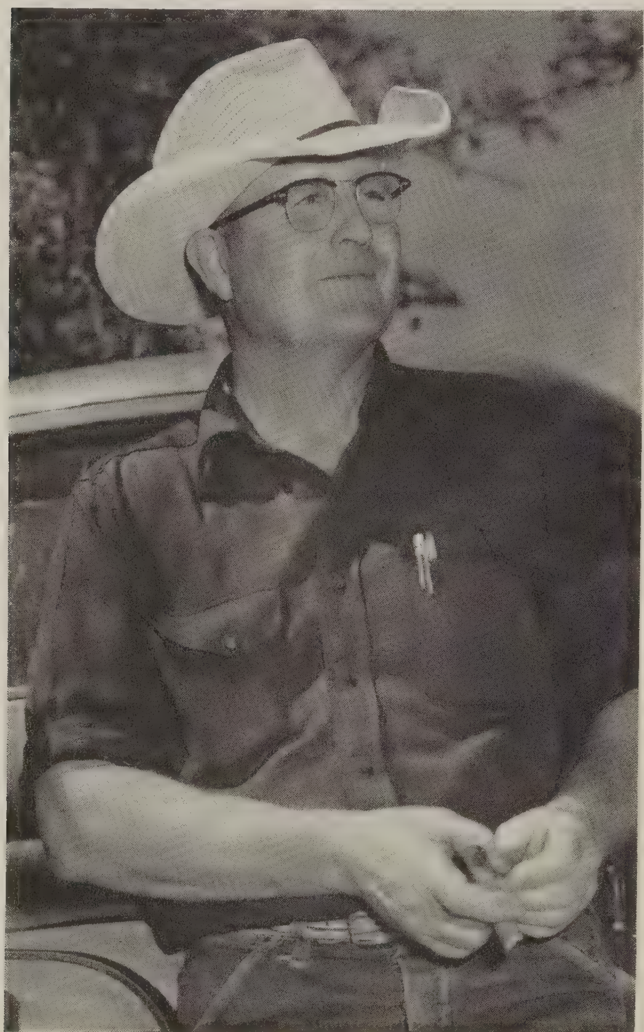
This well supplies 1,800 gallons per minute. It is one of the very few irrigation wells in this section south of the Arkansas River.

lands. McCormick checked the wind erosion by listing to turn up large clods.

"We now have a chance to lick the threat of the dust bowl if everyone will but follow the proper soil and water conservation practices," this farmer insists.

McCormick is always willing to try that which promises to improve his land and crops. His drilling of the first two irrigation wells in this section is a good example of his adventurous spirit, as is his intention to experiment with soybeans. We should note, too, that he now is growing 45 acres of sugar beets on the irrigated portion of his 320-acre tract.

Early spring rains brought good planting moisture to this part of Prowers County, and much of the blowing land is being seeded to grain sorghums which, if properly handled, will provide protection against wind erosion next year.



M. C. McCormick

Keith Matteson, who rebuilt a worn-out farm in 5 years.

ROAD TO PROSPERITY.—Five years ago Keith Matteson started to farm the conservation way. The change in practices cost him not more than $700 extra. But at the end of the 5 years this farmer took stock and found these results:

He could plow in April, use his equipment anywhere on his farm at any time, harvest his crops easier and at less expense.

He was selling hay instead of buying it.

He was getting 20 percent higher yields.

He had increased his production of milk per cow.

He was having a carryover of hay and silage, even though feeding a larger herd.

Matteson farms 345 acres near West Laurens, N. Y. He took over the place in 1946. He had an old tractor, 40 cows, no young animals, and little money to work with. Now, in contrast, he has a 70-head herd, with 43 milkers; 3 silos full of grass and corn, mows packed with top grade hay plus a surplus to meet any need. He is in a position to carry a herd of 100 head.

To get these benefits, Matteson, with assistance from the Otsego County Soil Conservation District, built 3,600 feet of diversions and cleared or renovated 19 acres of wasteland to make excellent pasture. He is preparing to clear still more land for grass and other crops.

We endanger or destroy the soil at our peril; any sound policy of land use must be synonymous with soil conservation and be in conformity with basic principles of soil use.

—From *Unasylva*, published by Food and Agriculture Organization

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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MEASURED IN MONEY.—R. H. Blosser found from a survey of 55 farms in Ohio that the net income from soil conservation practices used on Muskingum and associated soils is influenced by (1) disposition of crops, (2) types of livestock and (3) efficiency of forage consuming animals. The summary appears in the recent Research Bulletin 746, Ohio Agricultural Experiment Station.

Costs and return for a group of soil-depleting practices were compared with two different groups of soil-improving practices. Where all crops were sold, net income was $506 for "soil depleting farming" and $1,711 for "soil conservation farming with corn."

When all crops were sold, "conservation farming without corn" gave a net income of $1,057 or $551 more than "soil depleting farming." When forage was fed to dairy cows producing 5,000 pounds of milk for sale, net income was $1,661 for "soil depleting farming" and $2,558 for "conservation farming with corn." When forage was fed to cows producing 5,000 pounds of milk, "conservation farming without corn" gave a net income of $1,905 or $244 more than "soil depleting farming."

When forage was fed to dairy cows producing 9,000 pounds of milk for sale,

(Continued on page 155)

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Appropriate to this issue is this scene taken in 1938. It shows red spruce logs being hauled out by horse-drawn sled in Vermont's Green Mountain National Forest.

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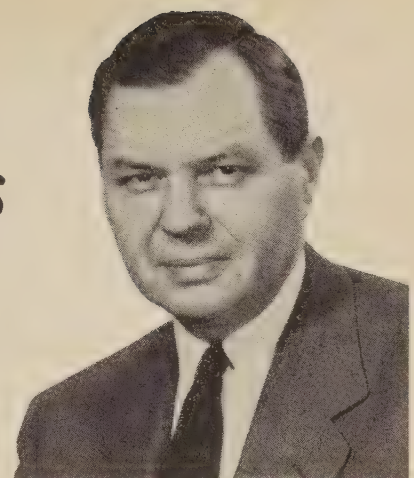
Fifty Years of Forestry Progress



R. E. McArdle.

By RICHARD E. McARDLE

Chief, Forest Service

THIS year, 1955, marks the 50th anniversary of the Forest Service. It was back in 1905 that the Forest Service came into being through reorganization of the old Bureau of Forestry in the Department of Agriculture, and the assignment to it of administration of the forest reserves, which until then had been under jurisdiction of the Department of the Interior.

In the half century since then, forestry has made notable progress. Research and experience have laid a foundation for sound forest management in this country, and forest management has been extended to millions of acres of public and private timberland. This great progress is not the result of Forest Service activity alone. It has resulted from the cooperative effort over the years of many groups and individuals—the Federal and State agencies, the forestry schools, industry, conservation organizations, and thousands of landowners, large and small. Working together, these private and public agencies and individuals have effectively demonstrated the values of organized protection against forest fire, insects, and disease, and of good management and wise use of the Nation's forests and related resources.

Outside the areas of urban development, most of our land falls into one or the other of two broad categories: it is cultivated land, or it is wild land. The cultivated land, the cropland plowed or plowable, amounts to about one-fourth of the total land area in the country. Another one-third of our total land area is forest land. Still another third is natural grassland or range. These wild lands, forest and range, thus comprise some two-thirds of all the land in the United States.

Since ancient times, man has plowed and cultivated the soil to produce crops. He has worked steadily to extend his croplands and make them more productive. For the wild lands, however, usually his only thought was exploitation. He took and used what they had to offer, the wood, the native forage, and other useful materials. Then either he tried to convert the wild land to cropland, or he abandoned it, left it for nature to take care of as she might.

Such was the attitude of the early settlers in this country. Their aim was to push back the forest to make room for more cultivation and settlement. They used the timber wealth they found in the forests, used it abundantly and lavishly and often wastefully. They ran their livestock on the native grasslands, often in such numbers that the forage growth deteriorated and the land began to erode. To very few persons did the thought occur that these wild lands might be so managed that their resources would be regularly and quickly renewed.

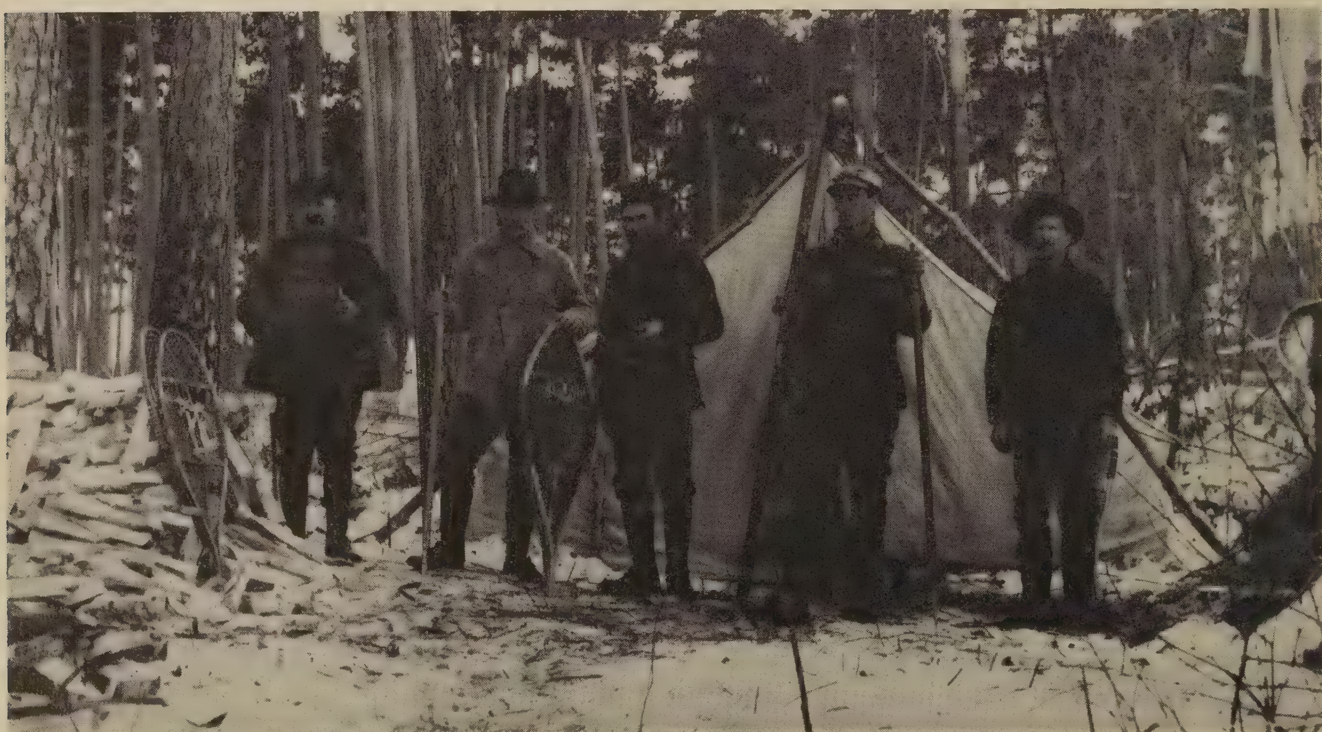
I believe the Forest Service's greatest accomplishment in its early days was to get over this idea—that wild land as well as cropland could be managed for continuous production and use—to a substantial segment of the American public. When the Forest Service undertook the administration of the national forests in 1905, it was the first large-scale on-the-ground application of this idea in America.

This was the idea embodied in the word "conservation," which half a century ago took on a new and special meaning, as applied to renewable natural resources.

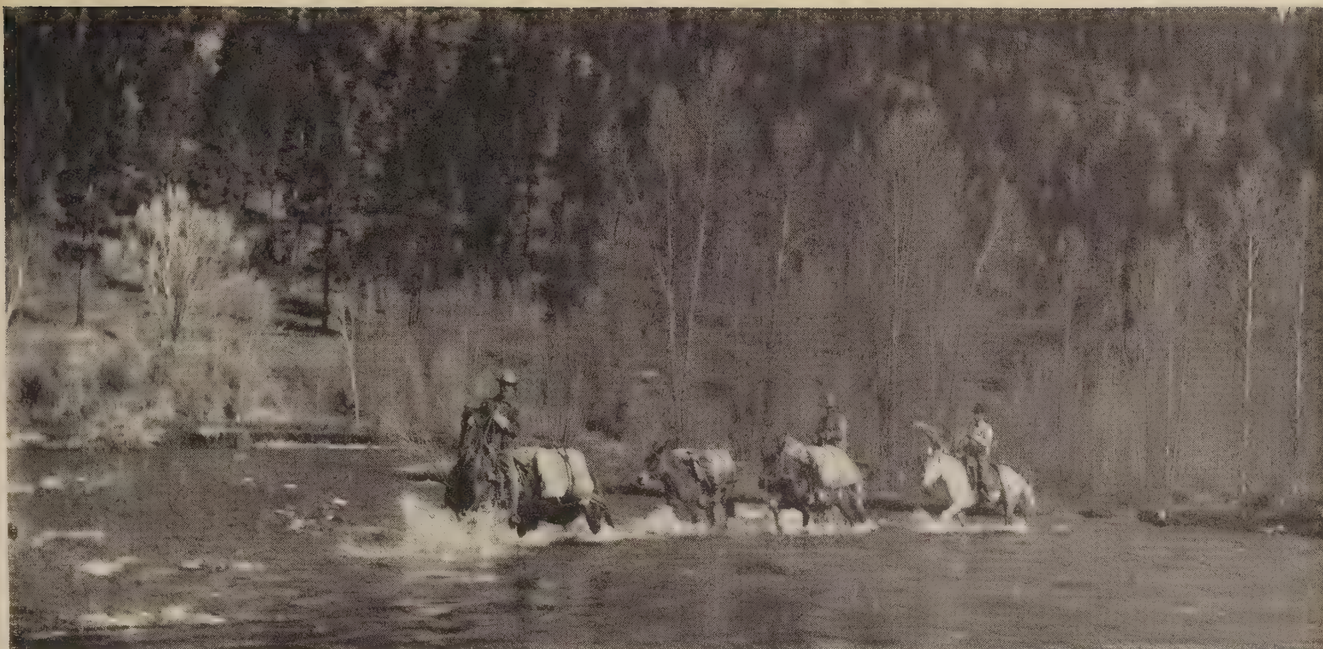
There had been earlier manifestations of interest in our natural resources. Soon after the Civil War, the spreading areas of cutover land and the great destruction caused by forest fires were causing some far-sighted persons to wonder about future supplies of timber. Some observant individuals were also becoming aware of the value of vegetative cover in protecting the headwaters of streams. A paper by the Reverend Frederick Starr, advocating a program of government-sponsored research on the management of forests, appeared in the report of the Department of Agriculture for 1865. In 1876, governmental forestry work actually got under way, when Congress authorized the Commissioner of Agriculture to appoint "a man of proved attainments" to study and report on the forest situation. In 1891, Congress authorized the establishment of forest reserves within the public domain, although not until several years later was any provision made for the protection and administration of these reserves. Meanwhile a Division of Forestry was established in the Department of Agriculture in 1881. During its first few years it consisted of a Chief and three field agents, whose combined salaries and expenses were covered by an annual appropriation of $10,000. The Division became a Bureau of Forestry in 1901.

The Forest Service came into being as the result of an act of Congress, approved February 1, 1905, which provided for the merger of the division administering the forest reserves in the Interior Department with the Bureau of Forestry in the Department of Agriculture. Theodore Roosevelt, ardent advocate of conservation, was President of the United States at that time. Gifford Pinchot, the first native American to obtain professional training in forestry, was the Forest Service's first Chief. Under the dynamic leadership of "Teddy" and "G.P.," the movement for conservation of natural resources began to make real headway.

At the call of the President, a Conference of Governors was held in 1908. Up to that time, most of the conservation thought and effort had been directed toward the forests. The White House Conference of Governors covered problems of soil, water, and other resources as



A timber survey crew in the Chippewa National Forest, Minn., 1903.



Half a century ago, the National Forests were largely underdeveloped, inaccessible back-country areas. Travel was mostly on horseback; supplies and equipment were transported by pack animals. Here we see some early-day Forest officers in the San Juan National Forest, Colo.

well as those of the forests. In his address to the Conference the President declared that all the various uses of our natural resources "are so closely connected that they should be coordinated, and should be treated as part of one coherent plan and not in haphazard and piecemeal fashion."

The Declaration adopted by the Governors urged "the continuation and extension of forest policies adopted to secure the husbanding and renewal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the maintenance of the purity and navigability of our streams."

The Conference of Governors set up a National Conservation Commission. It was organized in four sections—water resources, land resources, forests, and minerals. The three-volume report of this Commission issued in 1909, dealt with all these major resources.

Also in 1909, at the President's invitation, a North American Conference on Natural Resources was held in Washington, with representatives from Canada, Newfoundland, Mexico, and the United States attending. Again, this conference gave attention to resource conservation in its broadest aspects.

As a result of these and many other meetings, reports, and actions during the first decade of this century, public interest in conservation increased greatly, and national policies for the conservation of resources began to take shape. All this helped to pave the way not only for the rapid advancement of forestry work but for the development of national programs of soil conservation and other resource conservation that was to take place in subsequent years.

The work of the Forest Service in the past half century has gone forward along three principal lines: administration of the national forests; cooperation in forestry programs with the States and private forest owners; and research.

Establishment of the Federal forest reserves, later to be known as national forests, had begun in 1891. The act of Congress assigning them to the Department of Agriculture in 1905 followed a recommendation by the President that the "forest work of the Government should be concentrated in the Department of Agriculture, where . . . problems relating to growth from the soil are already gathered, and where all the science auxiliary to forestry are at hand

This area in Deschutes National Forest, Oreg., has been logged selectively, to utilize the mature timber and leave younger growth for successive crops.

National forests are supplying more than 5 billion board feet of timber a year to help meet the Nation's need for forest products. All National Forest timber is cut by methods which look to permanent, continuing production. Log hauling here is in the Eldorado National Forest, Calif.

Grazing livestock under permit on National Forest ranges. The Forest Service objective in range management is to keep the grazing in balance with forage growth.

for prompt and effective cooperation." The progress of forestry work in the Department of Agriculture in the years since owes much to this "prompt and effective cooperation" among the Department's agencies.

Secretary of Agriculture James Wilson in 1905 declared that all land in the national forests was to be "devoted to its most productive use, for the permanent good of the whole people." In the administration of these public forests a policy of multiple use has been followed which seeks to maintain a balanced production and use of all the forest resources, and to bring the largest total of returns and benefits in the public interest. In 1905, the national forests were remote back-country areas, largely undeveloped, and with few roads or other facilities for protection and management. Today they are playing a substantial part in the Nation's economy. They are supplying about one-tenth of the country's total yearly output of timber products. They furnish seasonal grazing for some 8 million cattle and sheep. They provide camping, picnicking, hunting, fishing, and other outdoor recreation for millions of people. They protect the sources of water supply for hundreds of cities and towns, for more than 13 million acres of irrigated farmlands, for some 600 hydroelectric power developments, and for thousands of industrial plants.

Forest Service cooperation with the States and with private owners now is carried on in several programs. One cooperative program provides organized protection from fire for State and private forest lands. There is also Federal cooperation with the States in the production and distribution of forest planting stock to landowners. The Forest Service provides subject matter for the extension work in farm forestry conducted by the State extension services with the cooperation of the Extension Service of the Department of Agriculture. The Forest Service also cooperates with the State Foresters in a program to provide on-the-ground technical assistance to owners of private forest land and to processors of primary forest products. In the development and conduct of watershed protection and flood prevention programs the Forest Service, in association with the State Foresters concerned, cooperates with the Soil Conservation Service

in regard to the forestry phases of the programs.

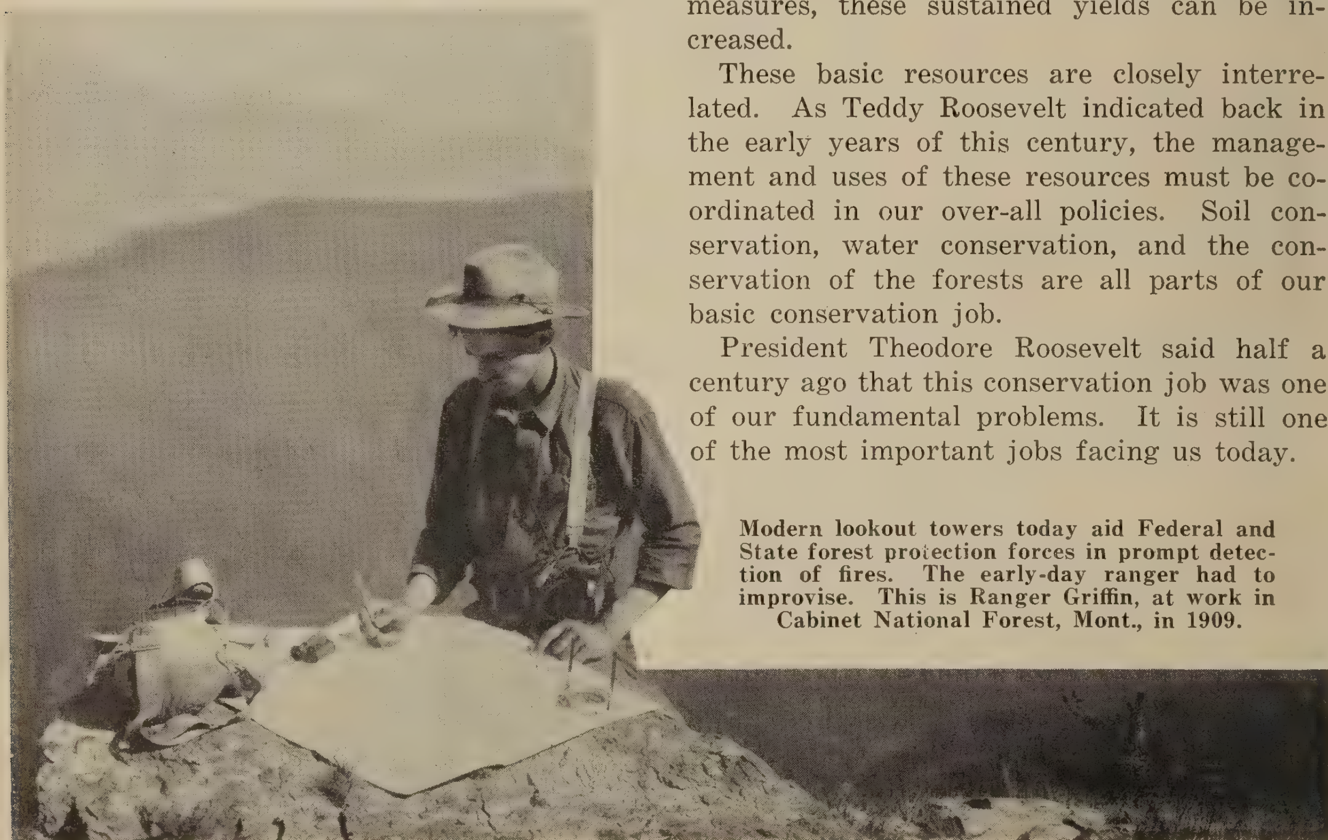
New knowledge developed through research in forest and range management and wood utilization has contributed much to the advance of forestry, both public and private. The Forest Service now maintains nine regional forest and range experiment stations; also forest research units in Puerto Rico and Alaska. The Forest Products Laboratory, maintained by the Forest Service at Madison, Wisconsin, in cooperation with the University of Wisconsin, is one of the world's largest institutions for research in the utilization of wood. Many of the research projects of the regional stations and the Laboratory are conducted with the cooperation of State agencies, industrial concerns, or private associations.

In the past 50 years, forestry has moved forward on a broad front. Along with the development of Federal forest work, there has been a big expansion in the activities of the State forestry departments. Forestry education has made great progress; today more than 30 universities and colleges in the United States are offering full professional courses in forestry. One of the most significant developments during the past half century has been the great advance in private forestry. Fifty years ago, few owners of forest land ever thought of managing their holdings for permanent production. Today large numbers are managing their woodlands for continuing timber crops. These include many of the big lumber and pulp and paper companies with large timberland holdings, as well as many farmers and other owners of smaller woodland properties.

Our pioneer forefathers in this country, when they sought a place to make a farm or to establish a settlement, looked first for dependable supplies of water, for wood to build their homes, and for good soil to grow their crops. Water, wood, and soil are still basic requirements of our economy. They are fundamental natural resources. And they are renewable resources. By wise management and use, the flow of streams and the yield of usable water from our watersheds can be maintained, the productivity of our cropland soils and of our forest and ranges can be permanently sustained. Often, through sound development measures, these sustained yields can be increased.

These basic resources are closely interrelated. As Teddy Roosevelt indicated back in the early years of this century, the management and uses of these resources must be coordinated in our over-all policies. Soil conservation, water conservation, and the conservation of the forests are all parts of our basic conservation job.

President Theodore Roosevelt said half a century ago that this conservation job was one of our fundamental problems. It is still one of the most important jobs facing us today.



Modern lookout towers today aid Federal and State forest protection forces in prompt detection of fires. The early-day ranger had to improvise. This is Ranger Griffin, at work in Cabinet National Forest, Mont., in 1909.

Vermonters Take Cruise

By SELDEN LEE TINSLEY

There's still much scenic beauty, notwithstanding eroded streambanks. Here one of the boats has just passed under the old covered bridge connecting South Newbury, Vt., with Haverhill, N. H.

OUTBOARD motorboats proved the best vehicles for Vermont's State Soil Conservation Committee during a recent tour of the Connecticut, mighty main stream for four New England States. Boarding five of the small craft, the group got a closeup of streambank problems in an 8-mile stretch between Newbury and Bradford as pointed out by tour guides, Almon Burgess, supervisor of the White River District, and Jack Garey, local Soil Conservation Service technician.

"Boat train" in cutoff through Stonecliff farm. A year ago farm machinery was working where these boats are now.

Closeup inspection where river undercuts bank until top falls in.

At one location featuring a mile-long oxbow cut by the previous spring's high water, the convoy boated easily over what had once been an excellent piece of farmland. Across the fresh channel, the conservationists saw the resultant island, 20 acres of the best soil in Vermont and now inaccessible for practical purposes.

Comparing another reach with a survey made 25 years before, the committeemen observed that banks had been cut back 200 feet at the point of maximum erosion. Action was seen to be continuing for a quarter of a mile.

Stabilized banks contrasted sharply with the problem areas over much of the route. From the boat, it appeared that most sections could be controlled by removal of large trees, by planting shrubs and protecting the sites from grazing. Riprapping with heavy stone was estimated to be the only remedy for deteriorating, high, steep banks. Costs, the committeemen conjectured, could run $100,000 a mile—too high for the farm pocketbook.

Chairman Paul R. Miller summarized the cruise: "We've seen part of a big problem on which farmers need help. Until such time as public help is available, however, farmers will do well to keep the banks protected from livestock, and to encourage shrubby growth."

Note.—The author is soil conservationist, Soil Conservation Service, Burlington, Vt.

DISTRICT PROFILE

PAUL SIMPSON of MICHIGAN

IN the spring of 1925, Paul Simpson and his young wife moved to their 253-acre farm near Leslie, Mich.

One look at the place today is enough to show the rich rewards that good soil conservation and soil building practices have brought in terms of better living.

"When we moved onto this farm," Simpson recalls, "we found most of the soil in a depleted, rundown condition. Very little livestock had been kept on the farm, and timothy hay sold for horse feed had been the chief crop. So far as I know, no lime or fertilizer had ever been applied. Our rye went 8 bushels per acre the first season. The need for lime was evident.

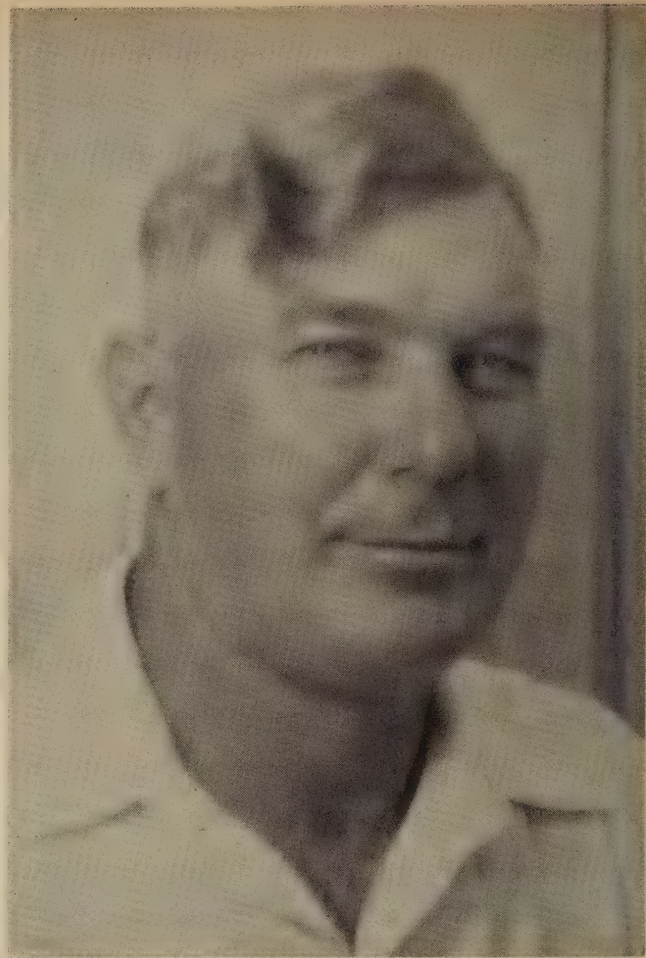
"The first year we bought and spread a railroad carload (50 tons) of ground limestone. The benefits were seen almost immediately.

"Poor drainage was also a serious problem in several of the fields. That same year we bought and installed, with horses and by hand, 2 railroad carloads—2 miles—of tile. Additional tile has been installed since. On wet, heavy land farm drainage is one of the most important and profitable of conservation practices.

"After the lime requirements were met and the drainage improved we started raising sweetclover with each grain crop. The deep roots of the sweetclover improved the soil structure and also aided the drainage."

For years Simpson was aware of the need for a local organization to assist farmers with their soil and water problems. "Local people have the final responsibility for conserving and improving their soil," Simpson reasoned.

He therefore was active in promoting and organizing the Ingham Soil Conservation District which provides an effective mechanism by which the soil conservation program can be locally managed and kept close to local needs. Simpson was elected to the first board of directors and has been an active member of the board ever since. He served as chairman for several years.



Paul Simpson.

In 1946, with the aid of technicians of the soil conservation service, he developed a practical land use plan for the farm. Lawrence Tripp, district farm planner, did much of the work of planning with him.

Simpson follows a 5-year soil-building rotation of corn, oats and 2 years of alfalfa-brome grass, followed by wheat seeded to sweetclover, which serves as a green manure crop.

Oats and wheat are fertilized with 350 to 400 pounds per acre of 5-20-20. For the past 5 years all fertilizer on the oats and wheat has been broadcast just before planting time. Simpson likes this way of applying his fertilizer. "It makes less work and saves time and money," he states.

Corn is fertilized with 200 pounds per acre of 5-20-20 at planting time, in addition to 8 tons of manure per acre. This farmer also

has taken the county agent's advice and is planting his corn thicker now. The results are good. Rye and sweetclover are usually seeded in the cornfields at the last cultivation, to serve as a winter cover crop.

On the one rolling field where erosion is a serious problem all tillage operations are done on the contour. Several water runways have been developed and seeded to a mixture of bromegrass and ryegrass. They are never plowed. These waterways average about 2 rods in width. By following good soil management practices, alone, crop yields have more than doubled, says Simpson.

Odd acres on the farm have been developed for wildlife. Simpson cooperates with the state conservation department to provide better wildlife food and cover. He has started on a woods improvement program in his 16-acre woodlot. He cooperates with the farm forester on this.

Sheep and dairy are big items. At present the Simpsons have 25 pure-bred Holstein milk cows. He has been in the Dairy Herd Improvement Association for 15 years and has built up a herd average of around 400 pounds of butterfat. There are 60 ewes.

Besides his farm work and conservation activities, Simpson finds time to be active in community affairs. He has been treasurer of the Barnes school for the past 20 years, a director of the Leslie Co-op elevator, and a director of the Leslie Artificial Breeders Association for a number of years. He is now a member of the Ingham agriculture committee, and of the Ingham agricultural advisory board. The Simpsons are members of the Leslie Grange and the Leslie Farm Bureau.

There are 3 daughters. Adelaide was graduated from Michigan State College in 1951 with a degree in home economics. She now is employed in Saginaw. Carolyn was graduated from Mason High School in 1950 and is now at home. Their youngest daughter, Barbara, is a senior at Mason High School. All three girls have had 4-H club projects.

SURVEY IN FORMOSA.—The land use capability survey of marginal zones between forest land and cropland in Taiwan, which has been carried out successively in Nantou, Changhua and Taichung during the past year is now moving into another six *hsien* under the sponsorship of the Taiwan Agricultural Research Institute.

Six survey teams have been organized with the cooperation of the Taiwan Forestry Research Institute and the Bureau of General Survey of the Ministry of National Defense to push the new phase of the work.

Work of the present stage is scheduled to be completed by June 1955. A total of 5,200 square kilometers of hilly land in marginal zones in Taitung, Hualien, Miaoli, Yunlin, Criayi and Tainan will be thoroughly surveyed. Maps and reports to be prepared from this survey will serve as very useful reference for planning a program of optimum use and conservation of the land resources of Taiwan.

Following one year's practical work and detailed study, agronomists and foresters on the island have classified all land of Taiwan into the following eight classes: Class I-IV, arable land, suited for cultivation; Class V, marginal land, good for forest and also fit for fruit orchards or pasture; Class VI, not suited for cultivation but good for forest or some kinds of tropical fruit trees; Class VII, fairly good forest land; and Class VIII, only suited for watershed protection or wildlife.

The marginal areas in Nantou, Changhua and Taichung, which were covered in the first and second stages of the survey work, have been tentatively classified according to this system. More than one-half of the land of Nantou and Changhua belongs under Class VII and over two-thirds of the marginal lands in this area are not suited for intermediary crops. Statistical work on the survey of the marginal belt in Taichung, however, is still underway, though the field work in that area has already been completed.

Expenditures required for the present stage of the survey work are estimated at NT $631,000. The whole project will be completed by June 1956.

MEASURED IN MONEY

(Continued from page 146)

net income was $2,813 for "soil depleting farming" and $1,083 for "conservation farming with corn." Where forage was fed to cows productng 9,000 pounds of milk, "conservation farming without corn" produced a net income of $3,833 or $1,020 more than "soil depleting farming."

When forage was fed to beef cattle, net income was $893 for "soil depleting farming" and $1,315 for "conservation farming with corn." When forage was fed to beef cattle, "conservation farming without corn" gave a net income of $482 or $411 less than "soil depleting farming."

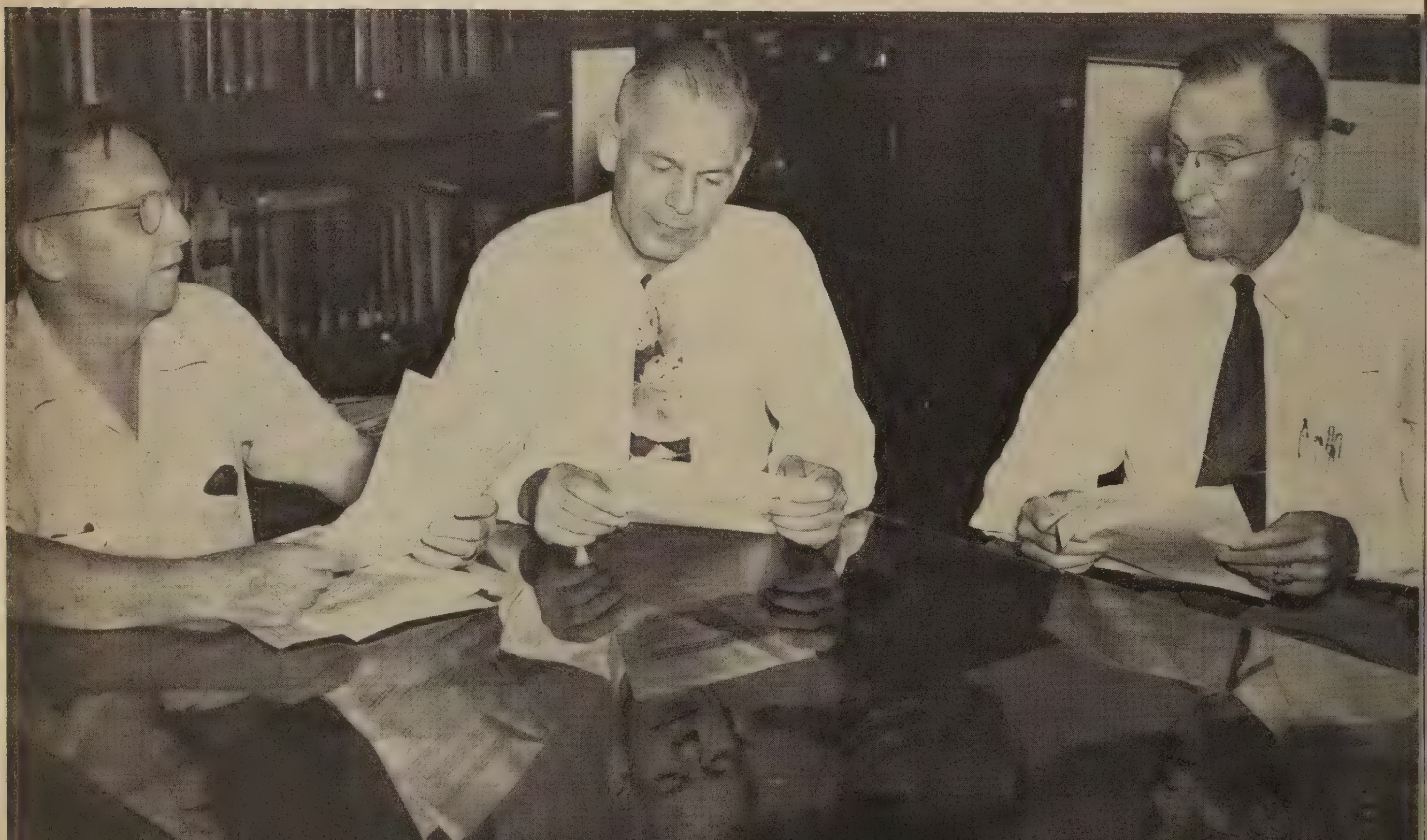
IT is in state groups like these that problems are considered which lead to scientific investigations of practical usefulness to conservation farmers.

Each state has its own way of preparing its report on research needs in the field of soil and water conservation. Here are six of the committees that developed 1954 reports, which were transmitted by state and territorial conservationists to the SCS Administrator. The state reports not only served as the basis for the national Soil Conservation Service research-needs report but were sent on in original form to the Agricultural Research Service.

SCS Administrator D. A. Williams in transmitting the reports to ARS emphasized 5 top priority groups of problems: (1) hydrologic; (2) economic aspects of soil and water conservation; (3) basic soil problems; (4) obstacles to range improvement; and (5) problems related to irrigation.

Plans have been made in operations-planning conferences for research-needs reporting in 1955 which will make use of the entire field staff to bring to the attention of state officers those problems on the land for which satisfactory answers are not now available.

FLORIDA: Colin D. Gunn, William H. Fifield, H. G Clayton.



[M]ONTANA: M. M. Kelso, Ernest H. Sandberg, Arthur [.] Post, Ashton Codd, Leonard Yager, Eugene H. [S]perry, Clifford Hide, Dave Cawlfield, Farrel A. Branson, Charles J. Whitfield.

[M]ICHIGAN: Ray Lewis Cook, Clarence A. Engberg, [M]ilo Benjamin Tesar, Howard Ream, Harold D. Lakin, [L]loyd Mildon Turk, Kenyon Thomas Payne, Ernest H. Kidder, F. W. Trull, C. Raymond Hoglund.

[A]LABAMA: J. C. Lowery, C. N. Kearley, O. C. Medlock, [.] Carnes, Fred Kummer, Coyt Wilson, Lawrence Ennis, [.] W. Pearson, Howard Rogers, C. E. Newman, Arnold A. Haugen.

Starting Points

PUERTO RICO: William Gracia, Joaquin Marrero, Glenn Fuller, Jose Vicente-Chandler, Burr E. Davidson.

ARKANSAS: Front—Hollis Williams, Lippert Ellis, C. A. Vines. Back—Hamp Burns, E. D. Butler, D. A. Hinkle, R. M. Marshall, R. Y. Bailey.

An Effective Watershed Program

By HON. EZRA TAFT BENSON
Secretary of Agriculture

I AM grateful for this opportunity to discuss the Nation's small watersheds problem from the Department of Agriculture's standpoint.

And I wish to thank your co-chairman, Raymond A. McConnell, Jr., of Lincoln, Nebraska, personally for inviting me.

Your sponsors' list for this first National Watershed Congress shows many and varied interests. To me this is ample proof that our Nations' water problem is an important segment of our larger problem of the interrelationship of land, water and people.

This Watershed Congress may well prove to be an historic meeting. It reflects the growing public sentiment for Nation-wide action on upstream watershed protection and tributary flood control.


The Secretary.

Thanks to President Eisenhower's personal and official concern, and the action of the 83rd Congress, the Department of Agriculture is for the first time able to deal effectively with the small watershed problem.

It can now begin to assist effectively those people who have a determination to get a job done. It can now assist those people, both technically and to a limited extent financially, to carry out the projects they cannot complete with their own resources.

We now have a means for bringing the water element into balance with the soil element in our national soil and water program. It gives us a new authorization for approaching soil and water problems on a watershed basis. It is a means of accelerating and implementing the soil and water program that has gained so much momentum over the past two decades. As an implementing tool, it offers new opportunities to work on problems that require community action.

For enabling the Department to render this service, I am grateful to Congressman Clifford Hope of Kansas and Senator George D. Aiken of Vermont for their leadership in securing enactment by the Congress of needed Federal legislation. In all fairness, too, I must say that the 1954 legislation was an outgrowth of bipartisan interest of several years' standing. The 1954 Watershed Protection and Flood Prevention Act passed without a dissenting vote.

No one can grow up on a southern Idaho farm, as I did, and be oblivious to the anxieties and heartaches surrounding the problems of water development and management. There, as is many other parts of the irrigated West, the irrigator with his long-handled shovel and rubber boots is almost a trademark.

Note.—The Secretary delivered this address before the National Watershed Congress, Washington, D. C., December 6, 1954.

Still fresh in my memory are the disastrous floods that time and again wrought havoc with the canal systems and buried whole farms under sterile debris.

Nor am I unaware of the suffering and anguish which the last four years of progressive drought have brought farmers and ranchers in the Southeast, parts of the Midwest and southern Great Plains.

There are reasons why I am firmly convinced that our water problem is welded to problems of land and people. Land and water are inseparable in planning and in use. For it is the water which carries away so much of our soil. The water problem is not just one of shortages or floods affecting cities and industries. The problem has its beginnings up on the farms and in the forests of our small watersheds.

The Department of Agriculture has been dealing with the watershed phase of our Nation's flood control problem since 1936. In the Flood Control Act of 1936 Congress determined that floods "constitute a menace to national welfare."

That Act authorized and directed the Secretary of Agriculture to make watershed surveys for flood control purposes in the same localities in which the Corps of Engineers was authorized to make river surveys for flood control.

Significantly, Congressman Hope pointed out two years ago that the Department of Agriculture had not been keeping pace with public interest in the watershed program.

Also recognizing this lag, President Eisenhower, in a mid-1953 message to Congress, stated:

"Our basic problem is to carry forward the tradition of conservation improvement, and wise use and development of our land and water resources—a policy initiated 50 years ago under the leadership of Theodore Roosevelt.

"To do this within the framework of sound fiscal policy and in light of defense needs will require the maximum cooperation among the state and local communities, farmers, businessmen and other private citizens and the Federal Government . . . It will require improved Federal organization to accomplish a more logical division of responsibilities among the various Federal agencies in order that resource development programs may be carried on with the greatest efficiency and the least duplication. And it will require comprehensive river basin planning with the cooperation of state and local interests."

President Eisenhower's message set forth the policy which members of this Administration are carrying out.

In the Department of Agriculture we are determined to assist farmers to carry out a more effective program of soil and water development and wise utilization on a Nationwide basis. This naturally includes protection and development of soil and water resources on individual farms and ranches and also in the small watersheds or subwatersheds.

Everywhere farmers are interested in the

Message from the President

I AM very happy to extend best wishes to all attending the National Watershed Congress.

The proper development and wise use of our water resources requires partnership. The Federal Government must do its part. States, local communities, and private citizens must assume their proper share of leadership and responsibility. I am therefore gratified to know that in this Watershed Congress, citizens of diverse backgrounds have joined together to help carry forward a program of planning and treatment for our Nation's watersheds.

On this initiative and interest, all of you have my congratulations. I hope you will have a most successful meeting.

/s/ DWIGHT D. EISENHOWER

efficient use of water. It is the lifeblood of the West, both for irrigated and dryland farming. And in the East, many farmers could use supplementary irrigation at some time during the growing season.

Showing interest, too, are increasing numbers of businessmen, bankers and other residents of towns harmed by flood from creeks and small tributaries of rivers.

In the upstream watershed development movement farm by farm water development and use is an integral part of the needs of the entire watersheds.

Under the 1954 Watershed Protection and Flood Prevention Act, State governments have a key position in helping local organizations to plan and finance watershed works of improvement.

The Federal Government will provide only such assistance as is needed and feasible to supplement the resources available from local watershed interests and in the State governments.

I wish to emphasize that it is the Department's policy to cooperate with State agencies which have responsibilities in the fields of land and water management. In this way we can assure compliance with State laws and help promote a coordinated effort toward accomplishing the objectives of the Act.

Last spring we had a most effective watershed exhibit in the Department's patio. It attracted widespread attention. It was my pleasure to accompany the President on a tour of the display. We were greatly honored by having Mr. Eisenhower make a special trip to view it. And it gave me personal pleasure to point out what I thought were some startling facts about the watershed and flood prevention problem.

In going over the exhibit, Mr. Eisenhower and I saw that more than half of the Nation's estimated $1.2 billion average annual floodwater and sediment damage occurs on the headwater streams and small tributaries. About seven-tenths of this upstream damage is agricultural, including loss to crops, pasture and damage to farm property, roads, stored crops and livestock.

And in many of the small tributary valleys, three-fourths or more of total flood losses are caused by comparatively small storms—storms which a community can expect once every 10 years or oftener. In many instances the damaging overflows occur once or more a year.

There is also, of course, sediment damage to the Nation's 10,000 storage reservoirs—other than farm ponds—which results mainly from soil erosion on our small watersheds.

Thus we can see readily that small watershed protection is sound and in the Nation's interest. As I said, this Administration has moved up rapidly on the job of getting under way a nationwide, yet locally adapted program of small watershed protection and flood control.

Prior to April 1, 1953, the flood control work of the Department was handled by a land and water resources staff in the Secretary's Office. On that day I abolished that staff and transferred to the Soil Conservation Service the general responsibility for all work under the Flood Control Acts. In doing so we enlisted the nationwide corps of conservation technicians that were dealing every day with problems of water management.

On July 23, 1953, The Congress approved a Conference Report on the Agriculture Department Appropriations Bill which included $5 million for a small watersheds protection pilot program.

The $5 million appropriation enabled the Department, operating through the Soil Conservation Service and the Forest Service, to start a new program of small pilot watershed projects.

One of the objectives of this program was to find the best ways of developing a local-State-Federal partnership in planning and carrying out the watershed protection and flood prevention projects. A second objective was to set up throughout the Nation demonstrations of the benefits derived from such work.

Now in its second year of operations, the pilot program is proving to be just what Congress expected of it—a valuable testing ground. It is showing with increasing clarity how successful watershed projects can be developed by local people with the help of agencies of Government; and also what obstacles to this type of approach exist in some areas.

The 1954 Watershed Protection and Flood

Prevention Act establishes permanent legislative machinery under which the Federal Government can cooperate with local organizations, including the States, in planning and carrying out works of improvement for flood prevention and the agricultural phases of the conservation, development, utilization and disposal of water.

Now for the first time we have truly national recognition by Congressional enactment of the important place of upstream watershed protection in our flood prevention efforts.

The new legislation also authorizes assistance in the agricultural phases of water, such as irrigation and drainage. Thus for the first time the Department is given opportunity to provide kinds of assistance which local organizations have been seeking to help improve water management for agricultural lands.

Public response to the new Watershed Protection Act has been substantial. Up to November 1, Governors of 37 States had provided administrative machinery for carrying out the States' responsibility in reviewing and approving applications from local organizations for Federal assistance.

Applications for assistance on specific watersheds bearing approval of designated state agencies or governors are being transmitted to the Department in substantial numbers.

Two additional new Acts of the last Congress also will help local sponsoring groups as they deal with their watershed problems.

One is the new provision of the amended Water Facilities Act, for making long term direct or insured loans in all States for soil and water conservation practices, irrigation, drainage, establishment of improved pastures and reforestation on farms.

I find great interest in this expanded source of credit. Many farmers and ranchers in the eastern areas of the country who have a dependable and adequate water supply are applying for loans through the Farmers Home Administration for supplemental irrigation. Other farmers have obtained loans to deepen wells or otherwise improve water supplies for their homes and livestock. Indications are now that farmers will make widespread use of this credit for soil conservation practices and pasture improvement.

We are pleased and grateful for the wholehearted participation of commercial banks and other lending institutions in the insured features of this loan program. It provides assurance that loan funds will be available this year for eligible farmers and ranchers.

Another authorization of potentially far-reaching effect in speeding up needed treatment of watershed lands is the provision in the revised 1954 internal revenue laws. This provision enables farmers and ranchers to treat expenditures for a number of soil and water conservation measures as current expenses that may be deducted from farm income for tax purposes.

Our pioneering work with watershed management and improvement naturally is guided and supported by much research that the Department, state agricultural experiment stations, and other state and federal agencies have accumulated over the years in dealing with the country's water problem.

The hydrologic research carried on in experimental watersheds as well as in the laboratories has been most helpful. So has the long-time research of the Department in other fields of water management, including irrigation and drainage.

But the need for more research in this field of water management is readily apparent. If more facts were available, I'm sure that we would witness less controversy among flood control interests.

While we do not have all the research we need, we do have enough to know that a combination of both upstream land treatment and works of improvement and downstream works of improvement is necessary.

The Department is convinced that upstream watershed protection programs are complementary to and not a substitute for needed downstream improvements. At the same time, it is equally obvious that downstream river improvements cannot be a substitute for upstream watershed protection.

I feel that Congressman Hope oriented the Watershed Protection and Flood Prevention Act rather well when he said: "It bridges the gap between our soil and water conservation programs, and our programs for development and flood protection in our major river valleys,

and greatly enhances ultimate benefits of both."

President Eisenhower acted with wisdom in this matter in appointing a Cabinet Committee on Water Resources on May 26, 1954. Chairman of our Cabinet Committee is Secretary of Interior McKay, with the Secretary of Defense Wilson, Secretary of Commerce Weeks, Secretary of Health, Education and Welfare Mrs. Hobby, and myself as the other members.

Our job thus far has been to review all the factors and forces that must be taken into account in the establishment of a Nationwide water policy and program. This is a beginning to more actively assist in the coordination of activities of the various government agencies in the field of water and to give consideration to national water resources legislation.

We are fortunate that we are entering the expanded watershed protection phases of the Nation's conservation program with a background of solid experience to draw upon. The principles embodied in the watershed legislation extend the basic concept of soil conservation districts; namely, the preeminence of local initiative and responsibility, with teamwork between local, state and federal agencies and involving federal technical and financial help only when local people request it.

The watershed approach, utilizing the new authorities available, simply provides the mechanism through which most of the land and water problems of a watershed can be solved by the local people living in that watershed. The new watershed protection program clearly should not be looked upon as some miracle coming out of the Federal Treasury. If it is successful, it will be because local people, working through their local organizations with the help of their State Governments, are determined to assume and maintain the principal initiative and bear a major share of the cost of the job, seeking from the Federal Government only that additional assistance which is beyond their technical and financial capabilities. We cannot separate people and program in this important work.

The new program is another link between science and the welfare of the people. The watershed approach makes it more essential than ever for the farmer to invest in his soil as if it were a bank for storing up fertility and managing his grass and woodlots to sustain or improve their yields.

The Department of Agriculture is wholeheartedly moving ahead with increased tempo in the field of watershed protection and flood prevention.

With the wholehearted cooperation of all concerned and the blessings of a kind Providence we shall succeed.

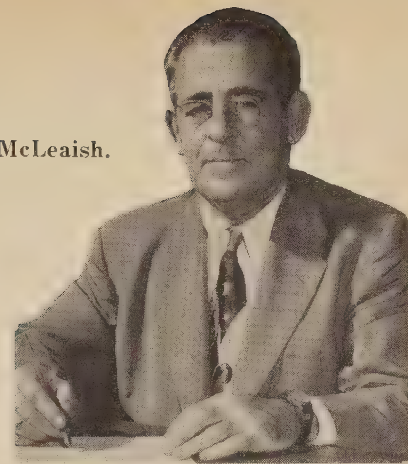
ALLEN TO PURDUE.—Durward L. Allen, formerly acting chief of the Branch of Wildlife Research, U. S. Fish and Wildlife Service, has been added to the staff of the Department of Forestry and Conservation, Purdue University. He will be associate professor of wildlife management in the School of Agriculture and in the Agricultural Experiment Station.

HOW TO RECHARGE.—Desilting, and treating of the recharge area by the addition of organic matter is the most effective method used for recharging ground water supplies according to George A. Whetstone. By using cotton-gin waste, infiltration rates of several times those of undisturbed soil have been obtained. Whetstone makes this observation in a recent issue of *Agricultural Engineering*.

> Our Number 1 job right now is to drive ahead with the conservation planning and treatment of every possible acre of our productive agricultural land, district by district, watershed by watershed, and farm by farm. Although the *water* problems of any given watershed are the key to its qualifying under the small-watershed program, it would be hard to overemphasize the importance of *land use*. Moving ahead with land treatment on individual farms is a primary consideration anywhere. Even where supplemental flood-prevention structures are necessary, agronomic, woodland and other measures on the watershed above them are of first importance in guaranteeing their efficiency and long life.
>
> —D. A. WILLIAMS, Administrator
> Soil Conservation Service

Water Loans

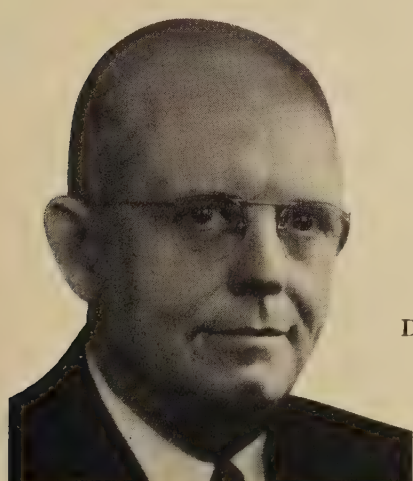
R. B. McLeaish.



TO reemphasize their mutual desire for effective teamwork, the Administrators of the Farmers Home Administration and the Soil Conservation Service have joined in a memorandum prompted by recent amendments to the Water Facilities Act.

These amendments extended the authority to make water facilities loans to all states and territories. They also authorized the FHA to make sound loans to eligible farmers, ranchers, and associations who are unable to obtain the credit they need from other sources, specifically for the purpose of applying soil and water conservation practices.

"The basic objectives of soil and water conservation loans that can be made by the FHA under this new authority," says the memorandum issued by R. B. McLeaish, and D. A. Williams, "are to encourage and facilitate the improvement, protection, and proper use of farmland by providing adequate financing for soil conservation, water development, water conservation and use, forestation, drainage of farmland, the establishment and improvement of permanent pasture, and other related measures. The achievement of these objectives should assist farmers in making needed land use adjustments, in bringing about desirable uses of acres diverted from the production of surplus crops, and in meeting the impact of adverse weather conditions on their farming operations. Similar opportunities to adopt soil and water conservation practices are afforded to farmers who obtain farm ownership loans under the authority of the Bankhead-Jones Farm Tenant Act.



D. A. Williams.

"It is the policy of the SCS to cooperate with the FHA in the widespread use of these authorities. When requested to do so by the FHA, local SCS offices will review the technical phases of material in loan applications of soil conservation district cooperators concerning soils information and engineering design and layout. Upon request by such applicants for loans for soil and water conservation purposes, the SCS will, within its available resources and consistent with other commitments, assist in the preparation of plans and designs and will supervise the installation of approved practices and measures.

"Soil conservation district supervisors should be encouraged to give high priority to requests for technical help by FHA loan applicants. In areas outside soil conservation districts, state offices of each agency may work out mutually acceptable arrangements for providing some degree of technical service to farmers who apply for loans for soil and water conservation purposes. However, it must be kept in mind that funds available to the SCS for technical assistance are justified to the Appropriation Committees specifically for assistance to soil conservation districts. Each FHA loan applicant requesting technical assistance from SCS should be advised of the opportunity and advantages of becoming a cooperator of a soil conservation district.

"We believe it is highly important that soil and water conservation measures planned and applied under FHA loan authorities meet technical standards that will insure the greatest possible benefit to farmers and ranchers and that will protect and improve the resources involved. This can best be accomplished by the use or development of a conservation plan for the entire farm unit. However, if warranted by existing conditions, the State Conservationist may arrange for the technical assistance to be limited to the improvements to be financed with the FHA loan."

Two Districts Grow Own Trees

By R. J. AMSTERBURG, Jr.

Irrigation system at tree nursery near Walhalla.

WITH the growing need for a supply of young pine seedlings constantly staring them in the face, the directors of the Manistee County and Mason County (Mich.) Soil Conservation Districts decided to investigate the possibility of setting up a cooperative district nursery which would furnish a constant supply of locally grown trees for reforestation in the soil conservation districts. This would end the problem of trying to obtain trees from other sources and having them shipped long distances to cooperators.

Note.—The author is work unit conservationist, Soil Conservation Service, Traverse City, Mich.

R. J. Amsterburg and D. Spuller inspect seedlings.

In the fall of 1953 the nursery committee was formed. The committee was composed of Dwight Spuller and Franklin Houk of the Mason County District, and George Meister and Forrest Chrestensen of the Manistee County District. William Brozzo and Robert Amsterburg, of the Soil Conservation Service, were brought in as technical advisors.

District directors at nursery for work bee.

A site that was suitable for the nursery was obtained through the cooperation of the U. S. Forest Service. It was located at the old CCC campsite near Walhalla in Mason County. The two districts held a work bee to get the site ready. A 4-inch well was drilled and the water situation was answered. The water was to be supplied to the seedbeds through an irrigation system.

In May of 1954 the beds were laid out and seeded to red pine, Scotch pine, Austrian pine, jack pine and Norway spruce. Approximately one and one-half million young trees were seeded.

This operation was successful and the young seedlings approached the damping off period. If they could survive this, then the nursery would be on its way. They came through in excellent shape with very little damping off, and with the addition of water in the dry periods they began to make excellent progress.

The nursery, nestled among the trees in a clearing in the forest, is now a green velvet mass of young seedlings as they prepare to go

through their first winter. They will be blanketed with a light covering of straw to protect them against the freezing and thawing which tends to heave them out of the ground and expose the roots.

Looking back over the first season of the new nursery, the directors of the two districts view their accomplishments with satisfaction, for here is a local problem being met on a local basis. You might call it a form of "tree roots democracy" instead of the often mentioned "grass roots democracy."

Midkiff Favors Grass

By VIRGIL S. BECK

"ABOUT half the cultivated land in southeast Colorado should be put back to grass, and most of the remainder planted to feed crops instead of wheat," declares Sam Midkiff, who is ranching and farming on 5,000 acres of land 3 miles north of Firstview, Colo.

"At times I think the best thing to do would be to sell my tractor and plow, scatter grass seed over the plowed land, and go to Florida for about 3 years. Maybe the land then would go back to grass and we wouldn't have dust storms every time the wind blows."

Despite his disgust with 4 years of drought which have created a serious wind erosion problem in his part of Colorado, Midkiff believes that the solution to dust lies in the widespread use of soil and water conservation practices.

Midkiff is secretary of the Cheyenne Soil Conservation District. He moved here from Texas in 1945. He already was experienced in conservation, having been a cooperator of the Martin-Howard Soil Conservation District near Big Spring, Tex.

Midkiff has a herd of 150 Herefords, of which 35 are registered. His permanent plan provides for 100 grade cows, 25 replacement heifers, and 25 registered cows. He has been getting a 90-percent calf crop from his cows, but the heifers haven't done so well. His steer calves sell at around 470 pounds, and the heifers at about 430 pounds.

Midkiff rotates grazing of pastures, and feeds 2 pounds of cottonseed cake to each cow daily during the winter. He plans to creep feed his calves this summer.

Water is a problem here. It is difficult to get a good well on much of Midkiff's land, so he has to haul water to some of his cattle on the range in order to utilize the grass.

Midkiff thinks it is too risky to grow wheat

Contour listing on this terraced field checked soil blowing.

where there is danger of soil blowing. He had 640 acres in wheat in 1952 and 1953. In the fall of 1953, he planted wheat and row crops in a stripcrop pattern, the strips being 16½ feet wide.

Midkiff plans to regrass 200 acres which he broke out in 1948. He made a good feed crop on this land in 1949, but the drought started then, so crops have failed 4 years straight. He will seed the 200 acres to a mixture of crested wheatgrass, blue grama, side-oats grama and clover next fall.

"I'm convinced that conservation farming will bring good crops if we work at it hard enough," Midkiff declares. "However, there are too many farmers who don't pay enough attention to their land. They run out from town now and then, do a little something, and then hurry back. This kind of farming isn't helping to solve our soil blowing problem."

Church and Soil

(From a sermon by Gordon Thorpe, Student Pastor, Zion Lutheran Church, Minot, N. Dak.)

THREE considerations make it inevitable that the Christian Church must concern itself with conservation.

The first of these is that God made everything good.

It is a distinctly Christian and Biblical viewpoint to consider the world and the things in it as good rather than evil. Most Greek philosophy, which incidently colors most of our western world's thought, considers matter and things as evil. Many other religions look on the human body and the world as bad or sinful. To them the only hope of man is to escape the world to enter the realm of the spirit, which alone is good. But the Bible says, that God looked at everything He had made, and behold, "it was very good." "The earth is the Lord's, and the fulness thereof, The world and they that dwell therein." (Ps. 24:1) The world, the soil, the land is good. God made it that way. We should think of it in that way. We should keep it that way.

The second consideration is that man has been placed as a steward over what God has made.

The Bible places great emphasis upon good stewardship. Unjust, unfaithful and poor stewards are condemned again and again in scripture. God has made us stewards over the things He has made. In Genesis 1:26 God said, "Let us make man in our own image, after our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the earth, and over every creeping thing that creeps upon the earth." When God created Eden He placed the first man and woman in the garden to till it and keep it. Man still holds the world in trust. Man is a steward of all which God has made.

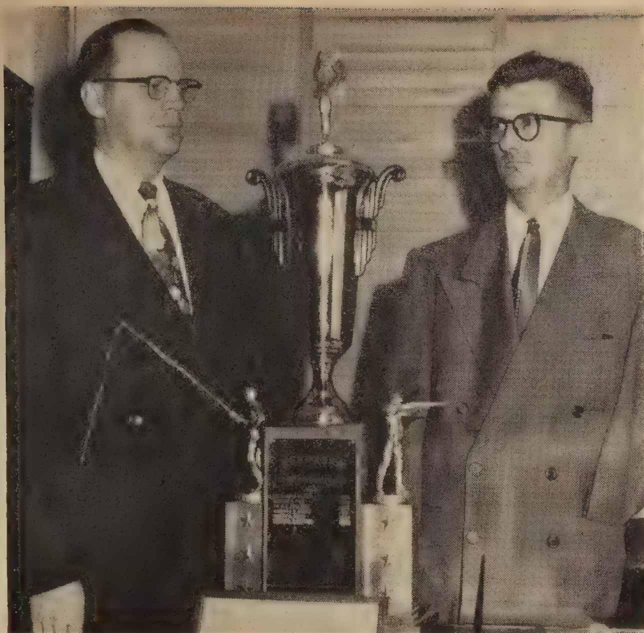
The third consideration which makes it inevitable that the church be concerned with conservation is that God is intimately concerned with man's material welfare.

When God placed man on the earth, He did not throw him completely on his own. God continues to watch over His children. "God makes His sun rise on the evil and on the good, and sends rain on the just and on the unjust." (Matt. 5:45) In the text from which I read, God shows His concern for His people's material welfare. The people in question were being led captive to a strange land. God told them that they should build houses, plant gardens, and seek the welfare of the city to which they were going. God is eternally concerned with the material welfare of the human race.

As far as I know, true Christianity has never sought to save a man's soul while letting his body rot. Real Christianity looks on man as having a body *and* a soul, *both* of which are important to God. That is why Christian missionaries carry not only Bibles, but bring with them also spades, medicine, teachers, clothing, tractors and bulldozers.

It is not necessary for me to point out how directly man's material welfare is bound to the soil. You know that when our soil is gone, so is our material security. And God is profoundly interested in Man's material welfare.

These three theological considerations make it imperative that the Christian church concern itself with conservation.



Flanking trophy: Freeman B. Decker, superintendent, Nebraska Department of Public Instruction, and recipient George E. Rotter, supervisor of conservation education.

TROPHY FOR EDUCATION.—George E. Rotter, editor and supervisor of conservation education for the State department of public instruction was the most recent winner of the Nebraska Conservation Trophy.

Dr. H. B. Kennedy, donor of the award, said the recognition goes annually, "to that Nebraskan who did most toward propagating and conserving fish and wildlife or improving relations between landowners and sportsmen or increasing co-operation among outdoorsmen themselves or educating our citizenry, particularly the youth, to practice conservation of all our natural resources."

Three of the six winners thus far have been in the field of conservation education.

REVIEWS

THE CLIMATIC ATLAS OF THE UNITED STATES. By Stephen S. Visher. 403 pp. Illustrated. 1954. Massachusetts: Harvard University Press, Cambridge 38. $9.

THIS book is, as Prof. Brooks notes in the foreword, "the first book on the climates of the United States since 'Climate and Man' . . . published in 1941." The Atlas contains over 1,000 maps and diagrams portraying vividly the major elements of climate. Of these, about 40 deal with one phase or another of precipitation, including a series on "excessive" rains, their seasons of occurrence as well as frequency.

In addition to Part V on precipitation, Part I on temperature is also comprehensive. Part II deals with winds, atmospheric pressure, and storms; Part III sunshine; and Part IV atmospheric humidity and evaporation.

An interesting group of figures deals with "Some Consequences of Climate on Land and Water—Soil Erosion, Topography, Lakes and Rivers." Another group is made up of 23 maps on climatic changes, a subject pertinent to our growing concern about our national water supply.

The individual U. S. maps are only about 3″ x 5″ in size and the author has been forced to generalize. To obtain a national view of our climatic patterns, these are perhaps quite adequate, though for local use more detail is needed.

—GEORGE W. MUSGRAVE

THE FORD 1955 ALMANAC. Edited by John Strohm. 208 pp. Illustrated. 1954. New York: Simon and Schuster. $1.

AGRICULTURAL information for the man of the soil, from suburban gardener to big-time farmer, is packed in the 1955 Ford Almanac now on sale at book and magazine stores. The 208-page book, sponsored by Ford Motor Company, is a new version of the 1954 edition.

Well illustrated, the Almanac is filled with scientific information on soils, livestock, fertilizers, crops, farm machines and a wealth of how-to-do-it features.

One feature is an enlarged section on "Farming Around the World," which draws heavily from information gleaned by Editor John Strohm during his 1954 tour of Great Britain and Western Europe.

Strohm, born on an Illinois farm, is an associate editor of Country Gentleman, past president of American Agricultural Editors Association and a consultant to the Secretary of Agriculture. He has visited more than 65 countries in his search for the latest agricultural information.

A forest-protected watershed: the timbered slopes of the St. Joe River drainage in St. Joe National Forest, Idaho. (See the article, "Fifty Years of Forestry Progress," in this issue.)

MARCH 1955

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

SOIL CONSERVATION•

MARCH 1955

VOL XX—NO. 8

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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FARM IMPROVEMENT AWARDS.—Some 80 chapters of the California Young Farmers Association are eligible to participate in a statewide Farm Improvement Program under a joint project of the Young Farmers' state organization and the Sears, Roebuck Foundation.

Designed to stimulate both immediate and long-range individual farm as well as general community improvement, the program offers chapter and individual awards for 1-year and sustained 5-year programs. Awards will be broken into local, regional and state brackets. They will consist of cash grants, trophies and plaques.

A LASS ON THE LAND.—Miss Sylvia Smith, a 17-year-old high school student of Kinards, is one of the youngest soil conservation district cooperators in South Carolina. She produces beef cattle, sericea, alfalfa, and fish on a farm given to her by her father this year. One of her first acts was to gain the assistance of her father and the local SCS technician, T. B. (Dad) Amis, in preparing a complete soil and water conservation plan, thereby becoming a cooperator with the Newberry Soil Conservation District.

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—In New England there is one harvest that comes in late winter, when the maple trees are being tapped. This fine picture was made by a photographer of the Department of Agriculture in Chittenden County, Vt. The farmer's sugarhouse is in full steam.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

The Hydrologist Looks Upstream

As a key man on the technicians' team, a hydrologist must avail himself of all pertinent information and data at hand. Watershed problems are widely varied, and must be met by a varied attack.

By H. O. OGROSKY

PLANNING a watershed is very much like planning a home. A good house is designed to meet the needs of a family. Its location or site must be considered, not only from the standpoint of providing the family needs but also to provide a pleasing appearance. It must be properly heated and lighted, and contain water and sewer facilities. And it must be within the means of the prospective owner.

The planning and construction of a modern house is not a one-man job. The architect who provides the overall plans usually seeks the advice of specialists in the fields of heating, lighting, and other phases of the work. In other words, the construction of a well-designed and well-built house is a product of teamwork, with the architect in charge during planning and the construction engineer in charge during construction. Success depends on how perfectly each member of the team carries out his assignment.

The development of a watershed plan is quite similar. Its purpose is to meet whatever problems occur in the watershed. If erosion is the primary consideration, emphasis is placed on its control. If floodwater damage is a major problem, effective measures must be taken to reduce this damage. As with the construction of a home, the control measures must be considered in relation to the sites.

A basement that is occasionally filled with water because of improper drainage will result in a very unhappy homeowner. Similarly, if a dam or levee constructed to protect residents from flooding allows water to seep or break through the protective works, here too will be a group of disconsolate people.

Note.—The author is hydraulic engineer, Soil Conservation Service, Washington, D. C.

As the architect relies on specialists in the design of a home, so must the watershed planner rely on specialists in developing a sound watershed plan.

In watershed planning, the Soil Conservation Service supplies field parties of engineers, hydrologists, geologists, and economists. These form the basic core of the planning party but it is by no means the extent of the specialists utilized. Agronomists, foresters, soil scientists, biologists, and others also are at hand to lend assistance.

The hydrologist deals primarily with water. When assigned to a watershed study, he must determine how often floods of various sizes occur, how much water comes from each tributary or subdivision of the watershed, what the effect will be from the application of various measures at any point in the watershed. Information of this kind is used by the design engineer in determining the spillway capacity of dams. The economist utilizes such information to evaluate the effects of the program in monetary terms. It is quite evident from these two examples that the success of a watershed program depends on the hydrologist as well as on the geologist, the design engineer, and all of the other participating specialists.

The science of hydrology is relatively new. Since it deals with the behavior of water in the atmosphere, on the ground surface, and underground, it is associated with such other sciences as meteorology, hydraulics, climatology, geology, agronomy, forestry, and soils. The hydrologist engaged in watershed studies has an exceedingly complex assignment. He must have sufficient understanding of the bordering sciences to know when it is advisable to seek guidance from specialists in other fields.

At the present time the Service is laying a basis for vastly improved water management.

We can always build protection works that will be safe by greatly exceeding what we expect to happen. But this is not always economical. We should be able to design works for water management that are safe and adequate but are also economical. Good planning in all fields will help to provide *more protection per dollar of cost.*

Recent legislation makes it possible to treat watersheds and to measure the results under the many different conditions found throughout the United States. This, in turn, most certainly will lead to greater refinement and precision in design. The science of hydrology has been brought to the point where we now can proceed with watershed development with confidence. However, like all other fields of endeavor, there is much development to be done to increase the efficiency of our work.

The general principles of hydrology have been known and practiced throughout the world. But the exact *amounts* of change in runoff that will occur under different climates, and in soils as a result of changes in type of agriculture or land use, are not always known. Few things are more variable than rainfall and its associated runoff. How much runoff to expect on a certain watershed following a certain rain is learned by actual measurement. Information as to how much is apt to occur following certain kinds of treatment likewise comes from actual measurement.

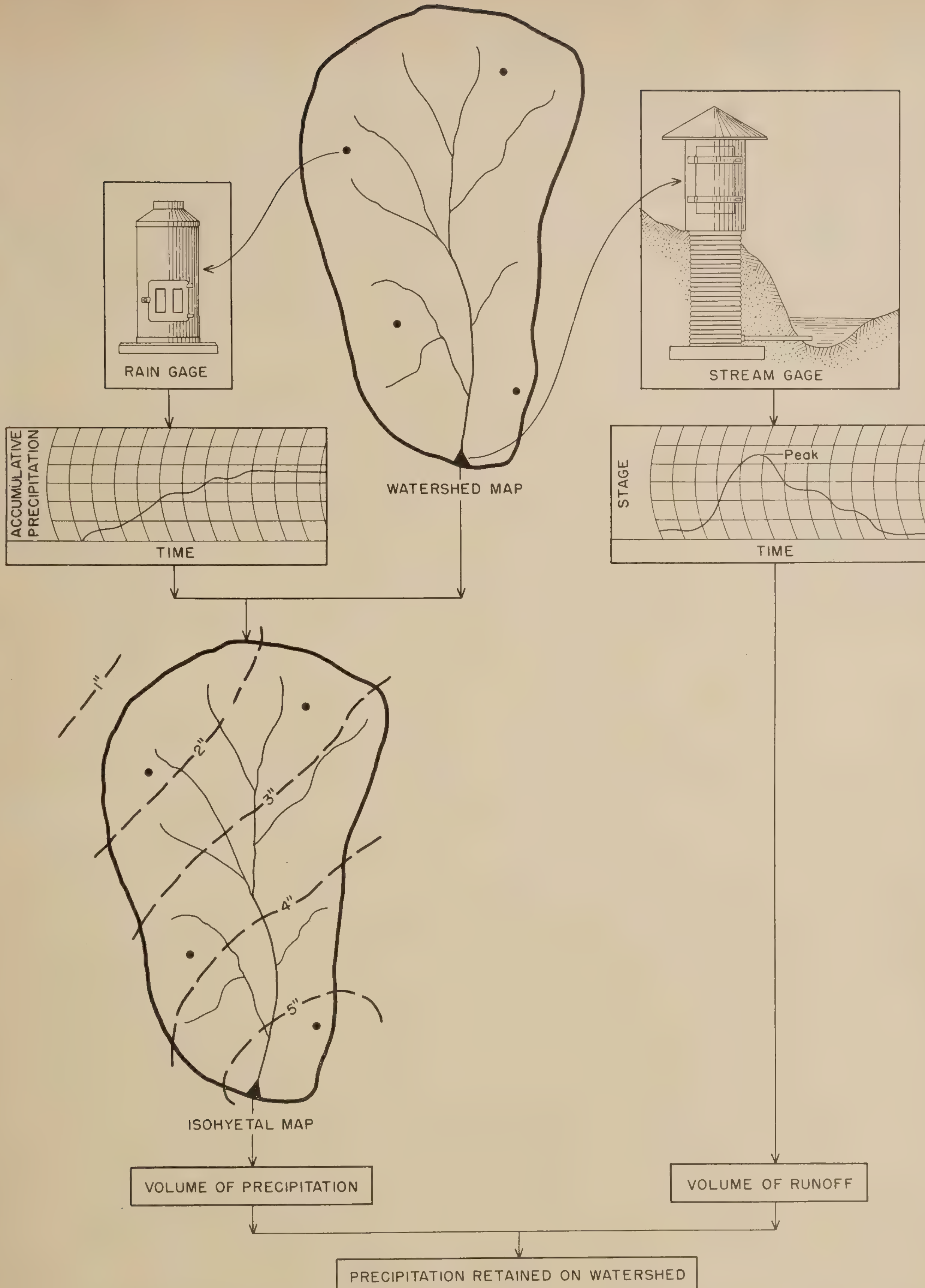
Steps already have been taken to focus all existing information on the problem, and through working relations with other agencies to provide still further needed information. The Soil and Water Conservation Research Branch of the Department of Agriculture is assembling the pertinent data on soils and vegetation, and their relation to runoff, that has been collected through the organized research of the past two decades. But this branch also is actively studying additional problems on which information is needed. This newly formed branch of the Agricultural Research Service is geared for effective and rapid progress toward getting answers to our most pressing problems.

The Weather Bureau, with its long experience in obtaining weather data, is collaborating by providing and analyzing needed rainfall records. Almost everyone knows that rainfall varies greatly (sometimes there are large differences in less than a mile), and that the total rainfall of a 24-hour period may bear no relation to the amount of runoff. We need to know more precisely the area over which different amounts and intensities of rainfall occur, and their frequency of occurrence. The Weather Bureau is helping to provide such information.

Once we know the rainfall and runoff of a watershed we can make a very close estimate of the amount of water retained on the watershed. Runoff records therefore are of great value in portraying an area's hydrology. The long experience of the U. S. Geological Survey in measuring runoff is being utilized through mutual agreement, so that runoff records are being obtained from many of the small watersheds. It is hoped to obtain the best possible information on rainfall and runoff for many types of soil, vegetation, and climates. The combined experience and facts thus obtained will lead to more effective and efficient planning for the small watershed.

The gain in information undoubtedly will be even greater than appears at first glance. Because of the real demand for more data on the response of soils, vegetation, and climates, the records from small watersheds provide opportunities in this direction not found in the existing records of the large areas which, in their composite, tend to approach an average of these conditions. But many of the small watersheds are predominantly characterized by one soil group. Often, also, a forest or a cultivated crop may be the predominating vegetation in a small watershed. Especially is this true of subwatersheds, many of which will be studied individually.

The hydrologic response of a given combination of soil and vegetation under different climatic conditions is an item on which there is little data. Yet before spillways can be precisely designed or before water-storage capacities can be accurately determined in different watersheds, more detailed data are necessary. Not only do we need to know what will be the outflow from areas differing in soils, vegetation, and rainfall, but we also need to know how often an outflow of a certain size is to be expected. Some small structures may be more


RAIN GAGE
ACCUMULATIVE PRECIPITATION
TIME
WATERSHED MAP
STREAM GAGE
STAGE
Peak
TIME
1"
2"
3"
4"
5"
ISOHYETAL MAP
VOLUME OF PRECIPITATION
VOLUME OF RUNOFF
PRECIPITATION RETAINED ON WATERSHED

efficiently designed to protect against, say, 25-year floods than 100-year floods. At the same time the probability of very large runoffs occurring must be kept in mind and weighed against the total damage they may do.

Assembling additional hydrologic information is only the first step in the efforts of the Service to improve its efficiency in watershed hydrology. Data must be presented in a manner that can be used readily on field problems. It must be in a form that can be applied in using the methods and procedures recommended by the Soil Conservation Service. Many procedures now in use by Service hydrologists involve long and tedious processes. Since the problems involved in the planning of small agricultural watersheds are not generally encountered to the same degree by other agencies, the Department of Agriculture must rely largely on its own staff to develop and improve methods and procedures in this field.

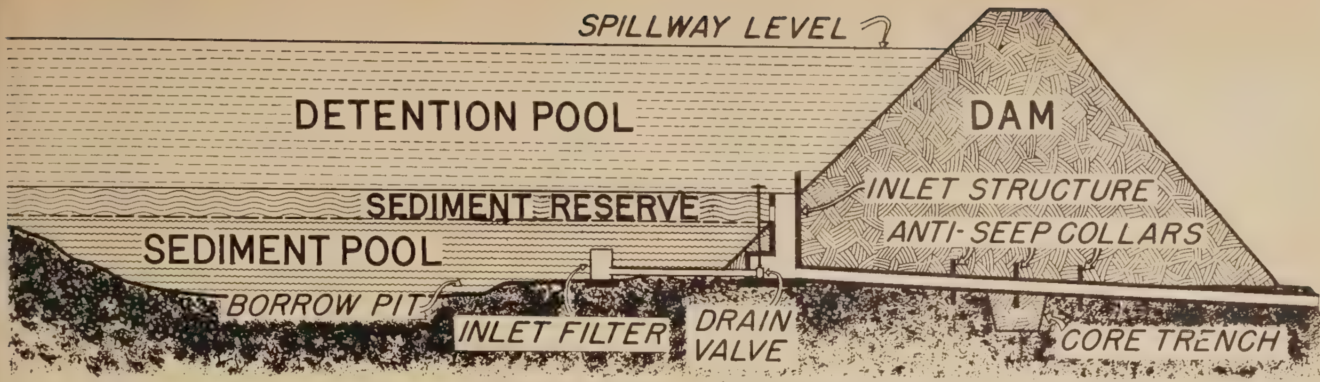
Recently the Service established a central technical unit at Beltsville, Md. for the purpose of improving the quality and efficiency of its hydrologic work. This unit is preparing a Service handbook on hydrology which will present widely used and accepted procedures and techniques. It will be used as a reference book for Service hydrologists and for training other Service personnel in the basic fundamentals of hydrology. Another activity of this unit is the preparation of a "Hydrology Guide for Use in Watershed Planning." This guide is, in effect, a testing ground for new or modified procedures and techniques that appear to be satisfactory but require nationwide testing in the field prior to their adoption as a recommended method or procedure. After a method or procedure has been field tested in all parts of the nation and found to be satisfactory, it will be incorporated in the Service's national handbook.

The hydrologist's problem in a watershed can be illustrated by a rather simple example. Assume we have a watershed with rain gages located at various points and a stream gage near the lower end of the watershed. A map of the watershed, plus rain gage data, provides the information to prepare isohyetal maps or maps with lines of equal rainfall for various storm periods (see sketch page 173). Knowing the area over which various amounts of rain fell, the total volume of precipitation over the watershed can be determined.

Similarly, a record of stream stages during the period of runoff permits a calculation of the volume of runoff from the watershed. The difference between the volume of precipitation over the watershed and the volume of runoff from a watershed is the volume of precipitation retained on the watershed.

If we have a flood problem in this watershed, there are several approaches that may be taken to reduce flood damage. One involves the consideration of measures that would not require any change in the runoff from the watershed. For example, would flood warnings permit residents to prepare for high flows and thereby reduce the damage? Would redevelopment, relocation, or zoning of the flood plain be feasible? Could local protection works be constructed that would permit the passage of floods without damage? All such measures must be considered. Usually, however, many of them can be eliminated from detailed consideration by a party reconnaissance of the watershed.

Another approach is to consider measures to reduce the stage or peak of a flood flow and thereby reduce damage from flooding. This can be accomplished in various ways, such as changing the stream channel capacity in certain stream reaches, by providing floodwater storage upstream or by increasing the amount of precipitation retained on the watershed during the storm period. In most cases it is found desirable to use a combination of measures. The improvement of the soil and cover will increase in varying degrees the amount of water retained on the watershed and also affect the rate of runoff. The changes that can be brought about by soil and cover improvement are limited, and although justified on the basis of the return to the individual landowner, do not provide adequate flood protection. Further reduction in stage can be made by retarding runoff, i.e., increasing the time and reducing the rate of runoff. Detention dams or floodwater retarding structures (see diagram page 175) which receive flood flows on tributary streams and discharge them at a fixed rate, tend to level off the peak flood flow. This measure, too, is limited to locations where suitable sites are available.



Section of typical floodwater-retarding structure.

All these measures must be considered and their effectiveness determined in various combinations. Because a structure functions well independently does not necessarily mean it will provide the same effect in combination with other works. The runoff from each tributary or subdivision of the watershed must be routed downstream through the proposed protection works to determine the effect of the works on the stage of floods of various sizes.

This illustration serves to point out some of the problems that the hydrologist, as well as others, must deal with in planning a watershed. But, if the problems were always as simple as this example, the task would not be too difficult. Let's consider how many small watersheds we know that have 4 rain gages and a stream gage. We are seldom this lucky. The hydrologist needs to provide answers to these problems, regardless of the data available. If gages are not located in the watershed he must utilize all the information he can, such as recorded high water marks, bucket surveys of rainfall, and data in adjacent watersheds.

He must go at the problem from many angles and check and recheck his results. Solutions can be worked out for these problems but where data are not directly applicable, considerable time must be spent to do a satisfactory job.

In carrying out watershed work, the Soil Conservation Service provides all of the resources it can to assist its field hydrologists to do an adequate and efficient job. Data and research results are being obtained from the U. S. Weather Bureau, the U. S. Geological Survey, and the Agricultural Research Service. Handbook material is being prepared and distributed and new methods and techniques are being developed for field testing by the Service's central technical unit.

Experienced hydrologists are field testing new methods and techniques in all parts of the Nation. We now have the wheels in motion that will permit Service hydrologists to do a better and more efficient job in all parts of the Nation than has ever been possible in the past.

ORDERLY EXITS FOR WATER.—Grass waterways are doing to Wisconsin farmland what fashion designer Dior is doing to the female figure—giving it the "flat look."

This tailoring process checks soil erosion, according to Al Wojta, soil conservation specialist at the University of Wisconsin. He says land can't soak up all the moisture from heavy rains and melting snows. Three to six inches of excess water runs off each Wisconsin acre every year. To carry it off safely, the first step is to tone down high spots and fill in gullies with a grader, scraper, or plow. Follow natural draws, Wojta advises.

This expert suggests that you use a wide V-shaped channel with a dished bottom in tailoring your waterway. Allow 20 feet of width for every foot of depth. This pattern will hold soil in place and allow for easy crossing with farm machinery.

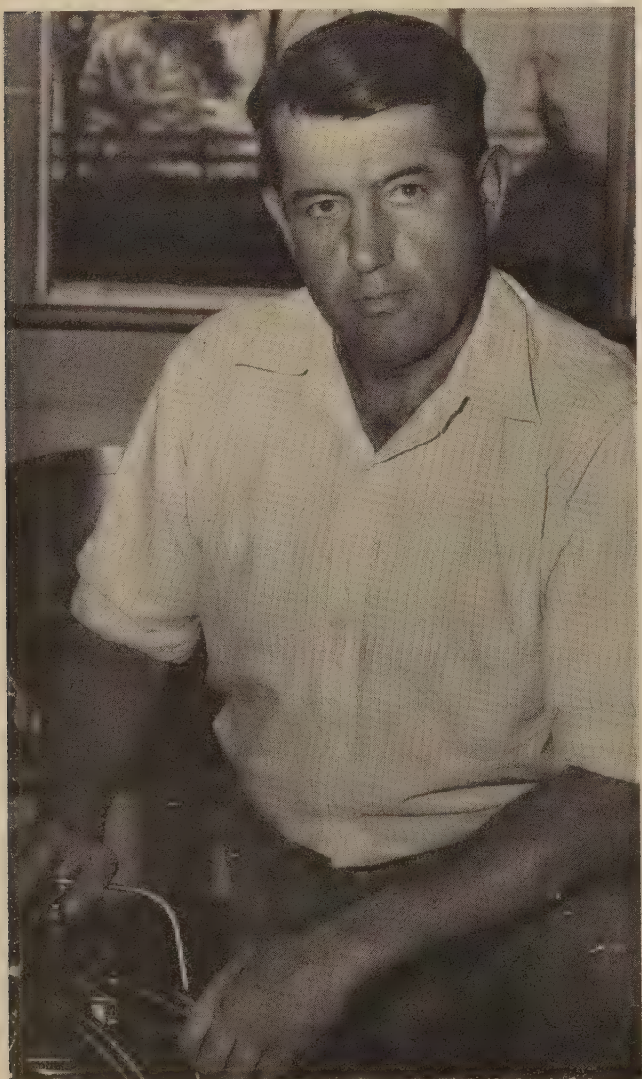
Most important steps, says Wojta, is to level off extra soil so there's a gradual slope to center. During heavy runoff, a bank on either side would leave wet spots and soon result in three waterways instead of one.

A grass waterway fits into an overall controlled drainage system with diversion ditches and terraces.

DISTRICT PROFILE

HENRY H. HACKMAN of PENNSYLVANIA

ABOUT a decade ago, in the hills northwest of the borough of Manheim in Lancaster County, some Pennsylvania Dutch farmers were astounded to see their neighbor rip out a brand new fence. The fence had been solidly erected in straight lines and now Henry H. Hackman, the "offending" farmer, had rebuilt this fence in sweeping curves to fit his new field layout. To this conservative community, such action was akin to lightheadedness, since it was a waste of good money to tear down a new fence and rebuild it nearby. Now, 11 years later, the neighbors have changed their thinking.



Henry H. Hackman.

Hackman has emerged from this fence episode to become one of Lancaster County's most highly respected and most enthusiastic exponents of soil and water conservation. He can show his community an increased livestock carrying capacity. His 5-cow herd has grown to 20; he gets yields of 45 bushels of wheat on land that formerly produced less than half of that; he harvests 65 bushels of barley instead of 45; and it has taken a 12-foot addition to his corncrib to handle the yield from a reduced corn acreage. Hackman says that high yields begin with the soil "and we could never produce what we do today if we hadn't stopped the soil from washing away."

Henry Hackman's farm consists of 25 acres of pasture, 12 of winter grain, 12 of corn, 11 of lima beans and peas, 9 of a sorghum-soybean mixture, 23.5 acres in grasses and legumes for silage, and the balance in woodland. The original cropland layout was in 3 fields. Now, Hackman has 12 fields, from 1.5 to 6.5 acres in size. These fields are on the contour and planted alternately in row crops and close-growing crops.

The present aim in the development of the conservation plan for the farm is a long-range pasture reseeding program. Hackman started last fall by discing 8 acres of old bluegrass pasture, seeding it to Balboa rye for late fall and early spring pasture, and plans to seed ladino clover and orchardgrass next spring.

Hackman installed the contour strips himself, with the aid of an SCS technician, doing this work in the evening after school was over for the day, and on Saturdays.

This farmer was born on a farm near Oregon, Pa., a small village about 3 miles southeast of where he now teaches physics, biology, and chemistry in the Warwick Union High School. He turned to teaching after graduating from Elizabethtown College, to earn more money for additional schooling. He earned a masters degree at the University of Pennsylvania and formerly taught 10 years at Newville.

Henry Hackman has a herd of registered Holstein Friesian cattle which, in 8 years of D.H.I.A. testing, has dipped below the 400-

pound butterfat and 11,000 pounds of milk average only three times. He is a director of the Lancaster County Soil Conservation District and of the Lancaster County Holstein Friesian Cattle Association; a member of the Manheim Rotary Club. He sings in the choir and teaches a high school age class of boys and girls at the Elizabethtown Church of Brethern. The Hackman's have three children—Dorothy (Mrs. John Grace), Willard H., 16; and John A., 7.

Despite his pressing school schedule, and his numerous other activities, Hackman finds time to further the work of his conservation district. He talks before groups, and appears with exhibits at community fairs.

Appropriately, the farm is named Runnymede—the name of the meadow where King John of England signed the Magna Charta. "It means 'freedom' to us and that is how we feel about farming," Hackman explains.

—W. MARTIN MUTH

Jesse Culp in a tape-recorded interview on the farm with J. P. Johnson, a supervisor of the Northeast Alabama Soil Conservation District.

A Voice for Districts

By JOHN M. CROSS

THE slogan, "Serving the nation's most thickly populated area," has a familiar ring in the Cumberland Plateaus and the narrow valleys of north Alabama.

Chances are when you hear it, it is being phrased by a familiar voice, too—that of Jesse Culp of radio station WAVU, Albertville, Ala. His words reach 30,000 farm families every day in parts of the northeast Alabama and Coosa River Soil Conservation Districts.

Jesse Culp begins his farm programs about the time folks are getting up in the morning, and he's back again when they sit down to lunch. Soil conservation districts in the area consider him one of their best friends. He attends numerous district supervisors' meetings, and he is always accompanied by his much-traveled tape recorder.

As soon as his early morning programs are over, he is usually off to visit one or more of the many farm families in the range of his six-station hookup. The clatter of machinery building a pond or drainage ditch, the hum of tractors building terraces, or the lowing of cattle on a good pasture goes onto the tape along with the voice of the farmer doing the conservation job.

Jesse Culp is an artist in the use of human interest. He keeps informed enough to ask leading questions and bring out the story in the farmer's own words. Any farmer who is doing a good job of soil and water conservation on his farm is likely, sooner or later, to be interviewed. His story will go out over the air to 10 Alabama counties.

Jesse is always ready, too, to meet special situations as they arise. Some years ago when

(Continued on page 192)

Note.—The author is work unit conservationist, Soil Conservation Service, Guntersville, Ala.

Tioga County's Small Marsh Program

Typical site for a small marsh development.

By JOHN J. WHALEN

New York State Conservation Department

IN 1949, when representatives of the New York State Conservation Department arrived in Tioga County with their new program, Federal Aid Project 48-D, "Improvement of Wildlife Habitat on Private Land Through Soil Conservation Districts," they were met with a warm welcome. Included in this project was a provision that provided financial support and technical assistance to landowners interested in building small, shallow-water marsh areas for wildlife. The directors of the Tioga County Soil Conservation District immediately accepted this small marsh idea. They included it in their conservation activities and assisted project personnel wholeheartedly with their time, money and equipment. The publicity accorded by the district eventually caused the project to reach the farmer and expand throughout the county.

Federal technicians attached to the district took over the difficult job of finding sites suitable for marsh construction. Arthur Lord, work unit leader, soon came up with the first marsh prospect—a flat 9-acre alder run on the farm of Russell Lippencott, in the top of the Pipe Creek watershed in the western part of the county. Project personnel immediately went to work on the site. The survey and design were completed and the construction cost estimated. The owner agreed to pay for the earthwork and install the trickle tube. Soon the first marsh in Tioga County was completed.

The news spread. Hundreds of people visited the site. Much to the amazement of local pessimists, 3,000,000 gallons of water ran off the 90-acre watershed, and in a month's time the marsh was filled with water. Local soil conservation officials liked the 11 acre-feet of flood storage embodied. Farmers liked the stock water. Sportsmen liked the wildlife. Everyone was pleased to see large numbers of migrating waterfowl utilizing the new pond.

Although the program has changed considerably in 5 years, in essence the foregoing story has been repeated many times in Tioga County.

To date, 68 small marshes have been installed here under the 48-D program. They vary in

size from 1.5 acres to 22 acres. The average is 5.4 acres. A total of 367 acres of land has been flooded. These marshes normally contain 239,928,000 gallons of water. In periods of heavy rainfall, they will store an additional 403 acre-feet of water.

Most people feel that at last a program for controlling heavy runoff, so destructive at times in hilly Tioga County, has begun. Efforts thus far are small in comparison with the total problem, but the ever-increasing activity should get results over the coming years. This activity, taken with the efforts of other agencies which have entered the flood control picture in the county, should go far toward solving a major problem.

The hill farmer on whose land a marsh is built is assured adequate stock water during drought. Formerly, many farmers were forced to haul water for their stock from the nearest large stream in even moderate drought. This was both time-consuming and difficult. In the future, we hope that this task will be eliminated.

Flood-control and stock-water benefits are the most important in the county. They directly affect the threats of lost income and property destruction. Other lesser benefits also are apparent. Fire protection to nearby buildings is one. In a low income county such as this, the possibility of realizing a return from fur always exists. Not too much interest in this possibility exists now, but in the future management of the marshes for their fur returns should gain some recognition. Other benefits include fishing, swimming, skating and the pleasure of observing wildlife attracted by these marshes.

The New York State Conservation Department receives almost immediate returns from the program. Most apparent is the utilization of the marsh areas for nesting, resting and feeding waterfowl. The first spring following construction, a marsh invariably has one or more successful wild broods of ducks. Observations on the Tioga marshes indicate that on an average 3 acres of marsh produce 1 brood of ducks. Typical of waterfowl nesting response is the Hindrickson marsh in the eastern part of the county. The marsh construction was completed at the end of June 1951. Thirty-five days later a brood of young wood ducks was observed on the half-filled marsh.

Indications are that during the spring and fall migration periods, there is heavy and constant use of the marsh areas as resting places for waterfowl. As many as 60 wild geese, and flocks of from 50 to 500 ducks, were noted at various times. Signs indicate other forms of wildlife are also benefited. Tracks of deer, rabbits and pheasants are commonly encountered.

Tioga County is not the most ideally suited county in the State of New York for marsh construction. The hilly terrain does not permit an abundance of natural marsh sites. Yet, this county has had the most successful marsh construction program in the state. This success is due primarily to the genuine interest displayed in the program by local farm agencies, the desire of the landowner to make the best use of the land at his disposal, and the friendly relations that exist between the local Soil Conservation Service technicians and the New York State Conservation Department personnel. These are the keys that made the program what it is today. With them, much has been done; without them, little or nothing would have been accomplished.

Earthwork and trickle tube on an early small marsh in Tioga County.

NEW LEAFLETS AVAILABLE.—Four new leaflets in the John Douglas Bulger series of recommended projects for conservation clubs and youth groups have been announced by the National Wildlife Federation: "Let's Plant Willows," "Let's Give a Tithe for Trout," "Brush Shelters for Wildlife," and "Let's Boxtrap Bunnies."

The leaflets may be obtained by writing to the National Wildlife Federation, Washington 12, D. C. Single, free; bulk orders, 5c each.

Above.—A 15-foot fire lane circles the tree farm, and redigging the lane is done by an 8-disc tractor-pulled plow. Below.—On a recent inspection tour: M. A. Peters, W. T. Odom, W. H. Thompson, Harry J. Hammet, Earl P. Barrios, and H. Ford Fallin.

Tree Farm Casts Its Shadow Far

Two million pine seedlings planted by a railroad replace an old sandpit and serve as a public demonstration of sound woodland management.

By R. A. MALONE

ON a picturesque 133-acre tract of land in the rolling hills country of northwestern Louisiana there is a most unusual facility of the Texas and Pacific Railway Company. It's a railroad farm—T&P's Tree Farm!

On certain days during the past few years, passersby may have been somewhat amazed to see forestry workers on this railroad property. They might have noticed a tractor-pulled 8-disc plow circling the fragrant pine-covered hillsides, plowing up a 15-foot-wide lane. It's a fire lane, protection against forest fire.

They might have seen a sled-like apparatus also being pulled by a tractor over certain stretches of flat sandy land amid this sprawling wooded sector. If close enough, they would have seen a forestry worker on this woodland toboggan deftly inserting pine seedlings in the rows cut by its plow blade. This machine is a mechanical tree planter and little loblolly pines were being planted.

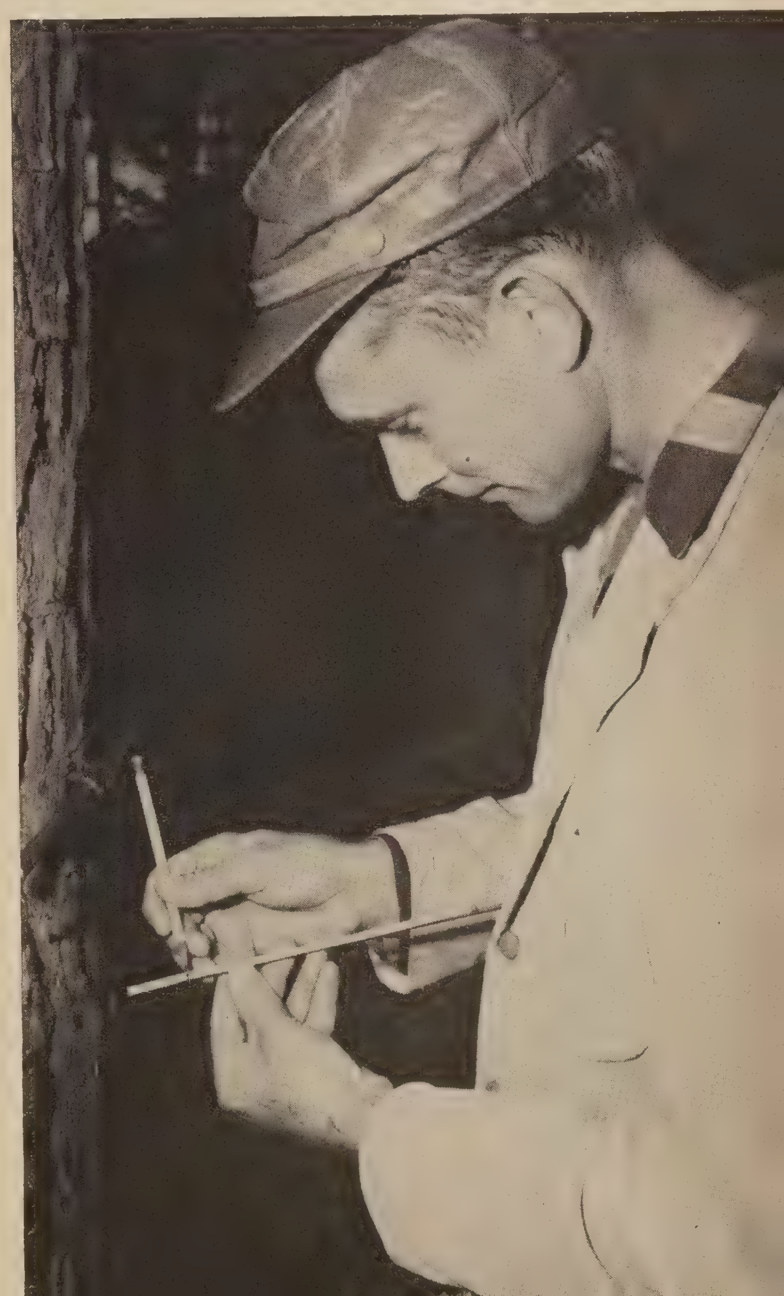
Onlookers hardly could have seen other workers down in the gullies on this land. But, they were there. Some might have been using a paint gun, squirting little dabs of paint on the trees—trees they were marking for deadening or for cutting. Other workers might have been using a spade-like implement in these gullies or in the stump areas. This implement, a forester's bar or dibble, is used as the fastest method of seedling planting in places not accessible to the mechanical tree planter.

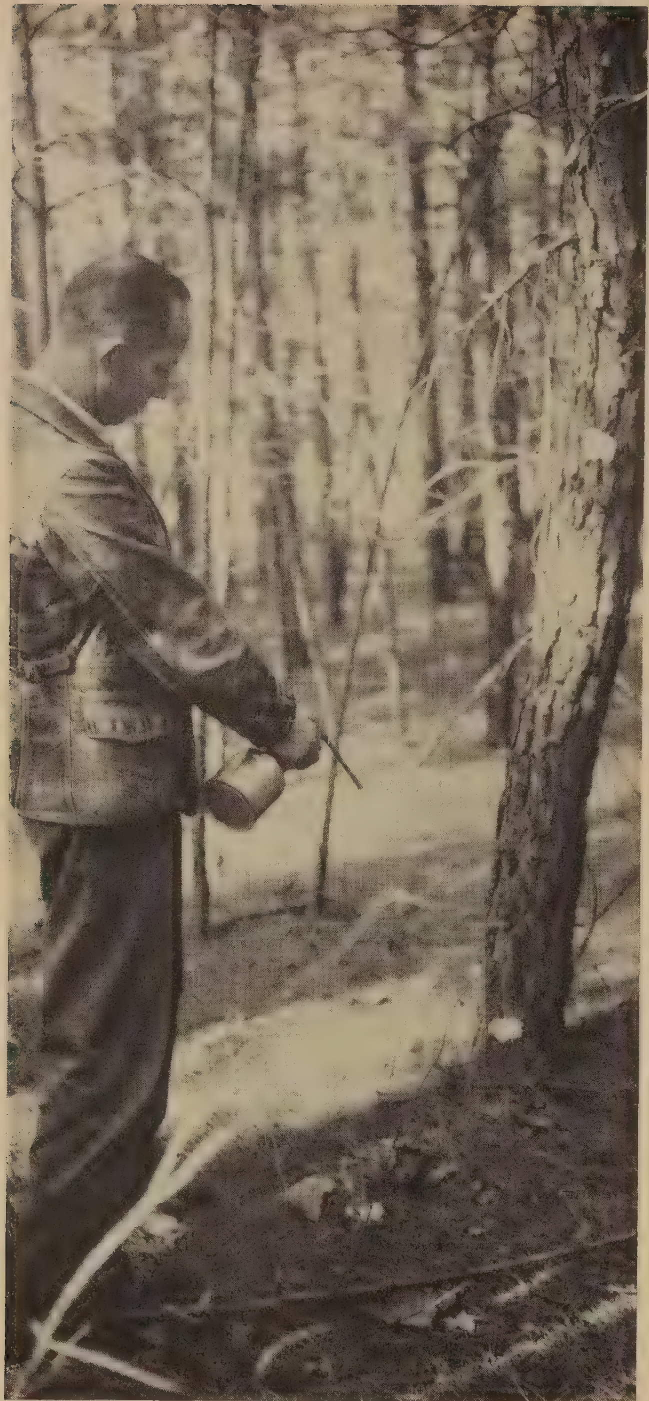
These forestry folks on this railroad land were woodland-wise workers of the Upper West Red River Soil Conservation District and woodland conservationists of the U. S. Department of Agriculture. During these past few years they have been transforming this T&P property, formerly a sandpit, into a budding tree farm.

Note.—The author is Public relations representative, Texas and Pacific Railway Company, and Editor of *Farming and Ranching Along the T&P.*

When the railroad acquired this property, a half-century ago, it bought the land, not for a tree farm, but to provide essential sand and dirt needed to build up the right-of-way for its trackage through the Bayou State. The deep pits and gullies are mute evidence of the transfer of tons of sand and dirt for the railroad roadbed.

Fallin checks age of this pine by counting rings in trunk core drilled from tree.





Harry Hammet squirts two dabs of white paint on a merchantable pine tree, marking it for cutting.

Bar-planting (using a dibble, a spade-like implement) is done in replanting where little pines have failed to survive and in areas not accessible to the mechanical tree-planter. There is no kneeling—that takes too much time and energy.

Peters holds his woodsman's rule at arm's length and breast high to calculate the diameter of this tree.

For a long time, however, T&P hasn't used this old sandpit, and towering native pines have grown up there.

Just 4 years ago, without any fanfare whatsoever, the Texas and Pacific, concerned with the conservation of the natural resources of the nation, started a reforestation program on this old sandpit property in cooperation with the Soil Conservation Service of the U. S. Department of Agriculture.

Conservation, like T&P tonnage, covers everything, and it has a tremendous effect upon the national economy. It is becoming more and more evident and essential that the soil, water and forests must be conserved. Woodlands, properly managed, conserve not only timber but soil and water as well.

A tree farm, of course, cannot be developed overnight. "Only God can make a tree," wrote the poet Joyce Kilmer. While that is true enough and while it's also true that it takes

Loblolly pine seedlings ready for planting, their roots lightly covered to keep them moist and fresh. In these three short rows are about 20,000 seedlings.

Mechanical tree planter holds attention of (l. to r.) Methvin, Thompson, Fallin, Peters, Barrios, Hammet, Odom, and Fuggin.

time—lots of time—for timber to grow, actually Mother Nature is a poor developer in comparison with the woodland conservationists of the Soil Conservation Service.

It was the hope of the Texas and Pacific that these colorful acres, in time, would serve as a model tree farm for the benefit of timberland owners to illustrate how even an old sandpit can be turned into a woodland wonder. To a certain extent that hope of the railroad *already* has been realized.

Deadening an inferior tree by girdling. Note diseased spots above and below the girdle.

The birth of this unique railroad project started in the summer of 1950 during a casual conversation between two oldtime friends, both of whom long have been concerned with the promotion and conservation of Louisiana's agricultural resources, State Conservationist H. B. "Joe" Martin and T&P Agricultural Agent Earl P. Barrios. The talk drifted around to the old railroad sandpit. Barrios wondered about converting it into a tree farm, perhaps?

"I can't think of anything that would be more influential and effective than for the T&P to turn this land into timber, to practice good timber management on your old sandpit tract," said Martin.

That was the beginning. The building of this "budding" tree farm started the next spring, in 1951, and has been in effect since.

Expert forestry methods, technical guidance and assistance have been provided through the Upper West Red River Soil Conservation District. This district embraces more than a million acres in northwest Louisiana and is headed by Supervisor W. H. "Bill" Thompson. In addition to Martin and Thompson, SCS workers

who have been instrumental in the reforestation project include M. A. Peters, H. Ford Fallin, Harry J. Hammet, and a number of aides and assistants.

The woodland plan being followed by the railroad and the technicians is a seven-point program: (1) protect from fire and grazing; (2) thin dense clumps of trees; (3) follow time schedule in cutting operations; (4) take crop trees at rate of one per acre per year; (5) take poorest trees first to improve quality of woodland; (6) remove absolute culls (inferior trees) by girdling, felling or poisoning; and (7) plant or underplant open areas not reseeding naturally.

Trees are thinned to what is called "D-plus-6 spacing." To determine the space required for each tree, an average diameter of the trees is calculated and to this average figure, 6 is added. The sum, oddly enough, is called feet. For example, three trees 8, 10 and 12 *inches* in diameter have an average diameter of 10 plus the 6, to make 16 *feet* required for proper spacing between the trees.

Diameters are calculated by using a woodsman's rule, holding it at arm length against the tree trunk and about 50 inches above ground, which is about breast high for the average woodsman. "DBH" (diameter breast high) is a standard term in the timber world.

In following the time schedule, a general cutting is made every 6 years. It is significant, however, that this cycle is not necessarily followed in the thinning of pulpwood and post-sized trees.

Culling inferior trees in a woodland is the same as keeping weeds out of a cotton patch or a cane field, it prevents worthless vegetation from reducing the yield. Culling allows ample room for the remaining trees to grow and develop, permitting adequate sunlight and soil moisture to penetrate and increasing thereby both the quantity and quality of merchantable timber.

Trees are marked distinctively for selective cutting and for deadening. Those to be cut for merchantable timber are marked with two little dabs of paint (usually white or yellow on Louisiana timber) with one splotch about breast high or higher and the other near the ground. Culls are marked with an "X."

Three-year-old pines thriving against background of fine timber. A tree-planter is setting out seedlings between young and old growths.

There are three general methods of deadening trees: felling, poisoning and girdling. To describe the first two is to comment on the obvious, but girdling may be of interest to the layman. A girdle on a tree is a band cut around the trunk about 3 inches wide and just deep enough to clean off the bark and thus kill the tree. It requires skill. If cut too deep, undesirable sprouting often results. An expert axe-wielding woodsman, believe it or not, can girdle a 22-inch-DBH tree in a mere few minutes.

And speaking of speed in forestry, the Service-directed timberland workers with a mechanical planter can plant from 1,000 to 1,500 seedlings *per hour!*

The first planting of pine seedlings on the tree farm, which is located just on the outskirts of Shreveport, was in January 1952, when 10,000 seedlings were put out. The next January some 25,000 more seedlings were planted, with an additional 35,000 planted in December 1953. This last December approximately 30,000 more were planted.

The seedlings set out were loblolly pine, which seems more suited to climatic conditions in Louisiana's Caddo Parish than any other of the many varieties of pine. And, actually, most of these loblolly seedlings were replantings.

The drought has taken a fearful toll each year since the tree farm started. Despite this continuing drought which has killed so many seedlings, the Texas and Pacific has gone ahead

in this project and has not hesitated to replant. It's encouraging to note that most timberland owners in this section of Louisiana have followed suit and also have replanted.

Timber is important in Louisiana, and the Bayou State is growing trees. It is not, however, the land of sawmills that it once was.

Harry Hammet finds picturesque beauty in healthy and flourishing pines of any age. He stands near a group of 10-year-old trees against a backdrop of 25-year-olds.

The state has more than a million acres in unproductive timberland. Moreover, during the past 5 years on the average, 37 acres of forest goes up in smoke every hour of every day in Louisiana! That's a staggering fire toll! Indeed, it alone points up the need for conservation.

The tree farm with its 133-acres of picturesque woodland is a setting of scenic splendor and is ideal for timberland. On the hills the old pines and some hardwoods tower majestically. Even in the gullies are many stately pines with DBH measurements of around 14 inches which, for their age, is a "high average for Caddo Parish," according to Conservationist Ford Fallin.

And, the growing number of little 1-, 2-, and 3-year old pines flourishing on the old railroad sandpit property are something to see. To the woodsman, they are as pretty as a litter of puppies to a dog fancier.

The Soil Conservation Service, of course, is glad to see the T&P and other railroads join in this service toward conservation. In some timberland areas, native trees grow so thick they appear very much like the "impenetrable forest," while in other sections virtually no trees grow at all. Good timberland management corrects conditions like these.

"Consistent improvement in the development on the tree farm," said Conservationist Peters "is evident with each passing year. The young trees look good and where old culls were deadened, new and strong pines are coming up."

Proximity of the tree farm to the soil conservation district's Shreveport office makes it convenient to show interested persons various phases of timber development work being carried out on the railroad property.

"Classes of school children, even those not yet in their teens, have toured the tree farm

(Continued on page 192)

Cooperating toward a common goal: Barrios and Hammet meet under a sign typifying the resolve to improve Louisiana forestry.

An Inside Look at the Soil

By C. L. W. SWANSON

WHEN most people think of soils, they visualize only the first 6 or 8 inches, known as the plow layer. Some think only of the surface.

Soils do have depth, and their "insides" vary tremendously from soil to soil. These variations are important in plant growth. We know for example, that plant roots, especially those of trees and certain crops, penetrate the soil to considerable depth.

When you look at the soil to about a 3-foot depth you soon realize that soils have their own special "character." They are usually made up of several layers or horizons. Each layer has a color, structure, texture, and organic matter content different from that of the other horizons. The sizes, amounts, and kinds of minerals and rocks also vary among the layers.

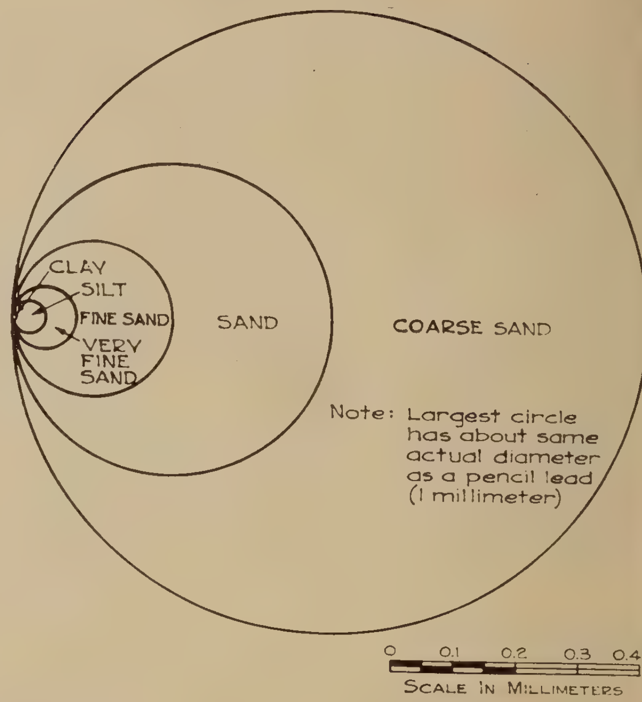
A typical soil is made up of sand, silt, clay, and organic matter. Usually it contains about 50 percent air space, which is made up of the pores and spaces between the soil particles and aggregates.

The drawing showing particle sizes gives some idea of the relative size of the various fractions. On a comparative basis the largest sand fraction is no larger than the lead in a pencil. The clay fraction is much smaller and can hardly be seen in the illustration. Actually, a clay particle measures 8-millionths of an inch and smaller.

Organic matter, made up of dead plant and animal materials, is also found in varying sizes depending on how well it is decomposed. Clay-size organic matter is called humus. Amounts of organic matter vary in soils, with the average ranging from 3 to 5 percent.

To learn something useful about clays, one needs to take an inside look at them. Only then can we find out what really makes a soil "tick."

Note.—The author is chief soil scientist, Connecticut Agricultural Experiment Station, New Haven, Conn. Based on an article in *What's New in Crops and Soils*, August-September 1954.



Relative sizes of the different soil particles are shown here. Coarse sand particles reach the diameter of a pencil lead. A clay particle measures only 8 millionths of an inch, and may come in even smaller sizes.

Clay is made up of extremely small minerals. Most of the clay minerals are particles ranging from 1-millionth to about 8-millionths of an inch in size. Because of their small size, clay minerals actually act like chemicals.

Clay and organic matter are the most important components of the soil because they play an active part in so many soil processes. They determine, to a large extent, whether or not you have a good soil for growing crops.

The clay fraction has what is known as the *exchange complex* of a soil. The amount of this material determines the soil's *exchange capacity*, in other words, its ability to hold and release such key plant food elements as calcium, potassium, and magnesium. When these elements are taken up by clays, it means that they cannot be leached readily from the soil. They are held in and on this exchange complex and are made available to plant roots as they are needed.

The mechanism of how this occurs can be explained rather simply. Clays are made up of

minerals of several kinds. Basically there are two groups of these minerals. All of them are more or less plate-like in nature, with some resemblance to stacked dinner plates.

Some of the clay minerals can expand and contract like an accordion. They expand when water is added, and they contract when dried out. One group of clay minerals does not have this ability to expand or contract and remains stationary. We call this the kaolinite type of clay mineral. The other major group, which takes up water and expands and contracts, is called the montmorillonite type of clay.

The chemical makeup of these major clay minerals is shown diagrammatically in the drawings. The montmorillonite group has a layer of silica, one of alumina, and another of silica, and kaolinite, only one layer of each. These clays are sometimes called 2 to 1 and 1 to 1 clay minerals because of the chemical arrangement of these layers.

These are new words—kaolinite and montmorillonite. Soil scientists are now using them in telling about some of their experimental results.

The space between the plates of the kaolinite type of clay mineral is about 10-billionths of an inch, but it does not have the ability to increase or decrease this space. The plate space in the montmorillionite type of clay minerals averages around 40-billionths of an inch, and it can expand to about 80-billionths of an inch.

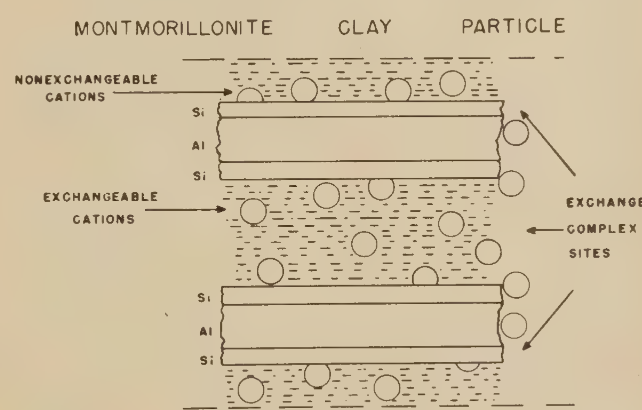
The diameters of small units of the various elements are not all the same. They vary in size—some are larger than others. For example, the potassium ion is 10.6 billionths of an inch in diameter, while the diameter of the calcium ion is about 8.5 billionths of an inch. Although calcium is smaller than potassium, calcium is always surrounded with tightly bound water. This causes the effective diameter of calcium to be greater than 8.5 billionths of an inch. It follows that, if the plates of the clay mineral do not open wide enough (see drawing of kaolinite and montmorillonite particles), certain ions cannot enter easily and thus be held in reserve. If not used by the plant immediately, they may be carried away through leaching.

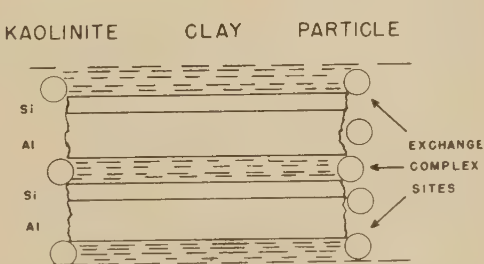
The montmorillonite type of clay mineral is the most useful in plant growth. Elements like calcium, magnesium, and potassium are small enough so that they can fit between the plates of this kind of clay mineral. Attractive forces hold them between the plates strongly enough so that they are not leached out of the soil.

Some elements can stick on the outside of clay minerals due to the attractive forces of certain elements for each other, something like a magnet holds iron. These elements vary with the type of clay mineral, so some clays hold more magnesium, more phosphorus, or more potassium than others.

The element hydrogen has a "toxic" effect on the basic elements calcium, magnesium and potassium. It tends to push these elements out of the platy minerals. Growing plants give off carbonic acid, which contains hydrogen, thus providing a source of this element in the soil.

When hydrogen pushes out elements like calcium, magnesium, and potassium, they are





Kaolinite and montmorillonite are two different kinds of clay particles. Fertility in soils high in montmorillonite is easier to manage than in kaolinitic soils. Drawings show differences between the particles. Montmorillonite has a layer of silica, one of alumina, and another of silica. Kaolinite has only one layer of each, and less ability to store and release plant food.

made readily available to the roots of plants. Consequently, it is not desirable that these elements be held too tightly by the clay minerals. Of course, when they are pushed out faster than the plant can use them, those fertilizer elements are leached out of the soil.

A very undesirable situation occurs when hydrogen entirely replaces the basic elements on the clay particles. The soil becomes acid and the basic elements are leached out. The usual way to avoid or remedy such a situation is to add lime. The lime will then replace most of the hydrogen, also making room for other elements like magnesium and potassium.

Since hydrogen serves a useful purpose in soils, we do not want to drive all of it out by making our soils alkaline. We keep our soils slightly acid so that some hydrogen will be available to perform its useful duties.

Montmorillonite clays may have about ten times greater exchange capacity than kaolinitic clays. They also have the capacity to hold several times as much water. Most of the soils in Connecticut, for example, have a predominance of kaolinitic clays and are, in addition, low in total amount of clay. That means that our soils are naturally low in fertility.

In Iowa, on the other hand, the clays are of a montmorillonitic nature, and the clay content is rather high. These soils are naturally fertile.

We increase the productivity of our soils by the use of fertilizers. In the case of kaolinitic clays, when fertilizers are added, the plant food elements, as for example phosphorus, are tied up so tightly that they are unavailable to plant roots. Also only small amounts leach out of the soil. But some of our soils are high in montmorillonite clay. These soils enable us to make maximum use of fertilizers in crop production.

What does all this mean? If we could learn more about what goes on in the soil when fertilizers are applied, it might be possible for us to make more efficient use of our fertilizers.

For example, it is often said that only 10 to 15 percent of our phosphatic fertilizers are used by the crop the first year. Possibly only 50 percent of the phosphorus is ever utilized, the remaining amount being tied up on the soil clay complex. Another fertilizer element that becomes fixed rather easily and hence unavailable to plants is potassium.

If we could find how to "untie" or release, soil phosphate and potassium, we certainly would be increasing the efficiency of our fertilizers as well as conserving our important natural resources. Untold millions of dollars would be saved the farmer in his fertilizer bill.

What we need now is more research to find out what really goes on in the soil when fertilizers of various kinds are applied. Much of the work to date on fertilizers has had to do with applying them on a field basis. This has been useful work, but it doesn't provide answers to fundamental problems. For example, the phenomenon of how ions like phosphorus and potassium are tied up in the soil is not well understood.

If the physical and chemical action of minerals were well known, useful solutions to the problem of fixation of fertilizer elements would become available.

One approach is to study the soil clay complex. One of the first steps along this line is to realize that all soils are not alike. By studying the major kinds of soils, we learn something about their makeup and their properties.

On the surface, solution to this problem may appear simple. But many kinds of research tools and much hard work will be required before the desired answers are obtained. The use of radio-active minerals, X rays, atomic knowledge, and other modern techniques will help us to reach our goal.

Erosion tends to remove more of the clay and organic matter fractions than the coarser sand particles. These fractions that erode most easily go into solution more readily and remain in suspension longer than the coarser, heavier sand fractions. Removal of the fine materials means that less fertility-holding material is left. Fertilizers will then leach more quickly as well as wash down the slope along with clay and organic matter.

Actually, when thought is given to the part clays play in land use, erosion is not always bad. If we had no erosion, we would not have the fertile bottom lands of the great rivers of the world like the Missouri, the Mississippi, and the Nile.

Some soils are low in fertility and are hard

to manage because they have not had enough erosion like the Putnam clay in Missouri. These soils have weathered so long that the soil particles all have broken down into fine silt and clay particles and plant nutrients such as calcium and magnesium have long been leached out. If some erosion had occurred, the fine materials would have been washed off, and new materials exposed to weathering which would release plant nutrients from fresh soil minerals.

Usually, however, our biggest problem is to keep the fine soil particles on sloping land where they will do the most good. Clays in place generally offer less soil management problems than clays away from home. On cultivated soils especially, we should be concerned about the fertility we are losing because of erosion.

On Doing Watershed Research

No. 1

This is the first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By WILLIAM C. ACKERMANN

TRANSFER of watershed research from the Soil Conservation Service to the new Agricultural Research Service provides a good opportunity to review this program. It is a chance to take a fresh look at this program which has been underway since the late 1930's. It is a chance to see where that program is now with respect to its original goals, and with respect to the changed and greatly expanded needs for watershed research information.

The original research program, including the hydraulics of conservation structures, sedimentation in streams and watersheds, and the hydrology of watersheds, was soundly conceived. Activities were widely distributed geographically and climatically, and the variables of land use and management were of vital concern at that time. If the program failed to meet the original objectives, it was primarily the result of uncontrollable factors on the national and international scene rather than experimental design. During the intervening years since the studies were initiated, many locations were necessarily closed after a few years of operation. At those which were continued emphasis was placed on collection of records, to the detriment of record analysis. So today we have an accumulated stockpile of records and the unparalleled opportunity to convert this into answers which will capitalize on our considerable investment.

Our philosophy for carrying out watershed research is both short range and long range. For the short look it seems abundantly clear that our first objective must be to analyze the accumulated records, interpret them, and place the results in the hands of those responsible for planning and directing our programs of soil and water conservation. This is a fortunate time to shift emphasis from record collection to record analysis because the point of diminishing returns in length or record has been reached in many cases. We think that this analysis should be just as complete and exhaustive as the data warrant. We should go further than merely make an orderly collection of raw data available on a cash-and-carry basis to him who wants to use it. Correlations should be made, cause and effect evaluated, and the limits of application and transposition should be defined. The analysis should proceed in the order of priority of need, both with respect to type of information and with respect to location.

Ample guidance on the priority of analysis is available through the research advisory committee and through the SCS statements of research needs. Perhaps more important than

Note.—The author is head, watershed hydrology section, soil and water conservation research branch, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

these have been the numerous, recent instances when conservationist and research workers have sat down together and agreed on the steps and direction to be taken.

It is important that we also keep our sights far down the road as well as on the immediate job ahead. Watershed research is by nature an expensive and long range business. Reliable conclusions cannot be drawn from a short piece of record, and findings in one location may be widely modified in another place where soils, climate, and crops are different. It is therefore imperative that research plans be wisely laid. In addition to the currently apparent needs across the country we should keep a close check on the findings of the experimental soil-water-plant research which goes on cooperatively between the Department of Agriculture and the state experiment stations. The most promising findings of this work should be tried out on watersheds. Only in this way will the results be ready when the widespread need is apparent.

In the past 20 years our understanding and appreciation of experimental design have been much sharpened. New watershed work should be started with the active participation of statistical consultants, so that when the experiment is ripe for termination some years later it will be possible to draw significant conclusions. We have learned other things, too, during these past two decades. One of these is to keep our data processing current with record collection. At reasonable intervals these data should be subjected to analysis to decide whether the point of diminishing returns has been reached. This will ordinarily be determined by whether there has been an adequate sample of the longtime weather expectancy, and secondly, whether the correlations between cause and effect are statistically significant. Only in this way can these longtime experiments be terminated without risking too little record to be conclusive or so much data as to be wasteful. And it *is* wasteful to collect more than adequate data when the decks should be cleared for experiments dealing with new ideas that continually come from the laboratory and the small plots.

It must be recognized that we cannot experiment on each creek in the United States, nor on each stream for which there will be a program of watershed protection and flood prevention. Therefore, we must choose our research locations with great care so the results will have the widest possible application. We should also strive to understand the underlying causes for the effects that we measure, so that with widespread locations and generalized understanding we can define reasonable limits for extrapolation of our findings.

Finally, we have an obligation not only to carry our experiments to conclusion and interpretation, but to present these results in a useful and clear-cut form which invites use and application. It should be the researchers' ambition not only to find answers, but to see them used. The established close cooperation between the SCS and the watershed hydrology section of ARS, we think, will insure this.

REVIEWS

PLANT REGULATORS IN AGRICULTURE. H. B. Tukey, editor. 268 pp. 1954. New York: John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. $5.50.

The editor has used the "group approach" in presenting the available information on plant regulators. Sixteen of the best known authorities on the subject aided the editor by preparing different phases of the subject, each in his own specialty, so that greatest coverage of the material is obtained. This gives more authority to the book, and the style of writing was so skillfully edited the reader is unaware that it is from 17 different authors.

The authors have presented their material on plan regulators to give an average college graduate in agriculture a workable understanding of the significance of plant regulators, what they are, how they operate, and where they belong in agriculture. It is implied that those trained in the agricultural sciences and working with farm people and their programs need to understand basic principles of how plants respond to plant regulators, what physiological processes are involved, what plant parts are likely to be affected, and in what way

internal and external environments may be involved. Accordingly, the material is not intended as a handbook of recommended practices. Instead it is prepared to provide background material. Each chapter is prepared in such a way as to begin with elementary facts and principles, and to move from there to more involved and advanced phases. Any person who really masters the material presented in the book in its entirety will have a good understanding of plant regulators and may feel well informed in the field.

A fundamental course in plant anatomy and plant physiology is extremely helpful in understanding the effect various kinds of plant regulators have on different kinds of plants. Much of this type of background is given in the first two chapters of the book before going into the chemical nature of the many plant growth regulators on the market. Following chapters give understanding to the use of plant regulators in encouraging root development; in controlling flowering and fruiting habits; in abscission of leaves or fruits and its prevention or control; the inhibition of sprouting of plants or plant parts in storage; in breeding of plants; in controlling weeds in lawns and under various crop and field conditions; and to equipment and methods for the application of the various plant growth regulators.

A person does not need to be a highly trained electrician to be able to understand why a light goes out when the switch is thrown. Neither does one need to be a highly trained chemist, plant physiologist, plant breeder or any one of a number of plant scientists to have a working knowledge of plant regulators and how they can be made to affect plant growth.

Plant regulators are fast becoming a very practical and useful tool in agriculture. Probably we are just at the beginning of a period of expansion in the use of these tools. It is important that men trained in the technical phases of agriculture and working with farmers have at least the basic training in plant regulators so they can make the greatest practical use of them. This book has been prepared with this view in mind and is well worth the studying.

—Grover F. Brown

MORTGAGE LENDING EXPERIENCE IN AGRICULTURE. By Lawrence A. Jones and David Durand. 233 pp. Illustrated. 1954. New Jersey: Princeton University Press. $5.

The economy of American landowners has reacted like a seesaw since the end of the eighteenth century. Boom in wartime and debt distress following war has been typical of the nation's agriculture.

The authors analyze the history and causes of distress in the various geographical areas of the country. Shifts in kind and size of operations, increasing land prices and mortgage debt, cultural change, drought, insects and rodents are evaluated as they affect agricultural production in various farming and ranching regions. Other factors are examined, such as differences in managerial ability of operators with similar kinds of operations, relationship between land quality, its sale price, producing power and debt load.

Evaluations show that fertile land with little tendency to erode appears capable of carrying greater debt load in proportion to appraised value than land low in fertility and subject to erosion. Operators with less productive land make exchanges oftener, and this type of holding is less apt to be transferred through inheritance or other family transactions.

—B. W. Allred

A WORKBOOK IN GENERAL AGRICULTURE. By Glenn E. Karls. 215 pp. Illustrated. 1954. Danville, Ill.: The Interstate Printers and Publishers.

AS stated in the preface, this book is intended as, "a discussion guide and work book in agriculture for elementary schools and high schools throughout the nation." It treats agriculture as, "the basic industry of the world, providing the basic necessities of life—food, shelter, and clothing to all people." The author is head of the agriculture department, Southwest Missouri State College.

This is exactly what it claims to be—a workbook. It is replete with scorecards and outlines and forms to be filled in by the student. Its general list of references is presented at the outset, for actual use, rather than thrown in at the end as an afterthought; each unit is

terminated with its own list of bulletins and other references of more specific application.

The nine units are as follows: American Agriculture, Soils, Conservation, Dairying, Poultry, Vegetables and Small Fruits, Farm Animals, Farm Crops, Farm and Home.

Necessarily elementary, the workbook nevertheless is up to date. Included is a standard scorecard for land and soil conservation judging; also, the accepted land use capability classification.

Paper covered and in the convenient size of 8½ by 11 inches, this publication may be expected to find its way to many a school desk, where it will help the young generation toward a proper understanding of modern American agriculture.

—W. B.

PRINCIPLES OF FARM MANAGEMENT. By J. Norman Efferson. 431 pp. Illustrated. 1953. New York: McGraw-Hill Book Company, Inc. $6.

The author proceeds with the thesis that farming is a very complicated business. He examines farming in the light of a business enterprise and sets forth his ideas on how to set up a farming operation for profit.

Dr. Efferson says: "The typical farm operator of even a very small farm is an investor, a manager, a laborer. On larger units he is, in addition, an accountant, a labor-relations expert, and on occasions a veterinarian, a plant pathologist, or an entomologist. Because of the multiple-purpose nature of the ordinary farm business, statistical measures to determine the financial position, success, or failure of a farm business are difficult to establish."

There is a good chapter on marketing costs and methods of doing this phase of the job better and cheaper. The chapters dealing with production and labor efficiency will appeal to those caught in the current "cost-price squeeze." Other good chapters include those on "Establishing the Farm Business," "Managing Farm Finances and Organizing," and "Operating the Farm Business."

This book is suitable as a text for farm management students and is written so understandably that farmers also can make ready use of it. The author made no atempt to cover business management as it specifically applies to western ranching.

—B. W. Allred

TREE FARM

(Continued from page 185)

here," said Harry Hammet, work unit conservationist. "And in addition to these youngsters, this timber management plan on this old sandpit property is serving as a model demonstration for woodland owners and developers throughout the state."

In Caddo Parish the district has made amazing progress in the past few years in promoting more planting of trees, conservation, and proper timber management.

Prior to 1952, practically no pines were planted in the parish, but since then the number planted in Caddo Parish through this fine work has increased almost tenfold each year. In 1952, 75,000 seedlings were planted; in 1953 the number jumped to 721,000; and last year, the figure was 1,317,200.

Such progress is truly remarkable, and casts an optimistic light on the future of the timber industry in this section. Only God can make trees—but many can help conserve them.

A VOICE FOR DISTRICTS

(Continued from page 177)

tall fescue grass was getting a good start in Alabama, many of the seed patches were badly infested with ryegrass. He did a special broadcast reminding farmers of the importance of harvesting and selling pure seed.

Describing the difference in appearance between fescue and ryegrass seed heads, he urged farmers having infested fields not to put such seed on the market. By following up with his seedsmen friends and with harvesters, he played a big part in the movement of pure seed from one farm to another.

Anyone who has something sound and progressive to present to farmers in north Alabama goes looking for Jesse Culp to help with the job. And if it's soil and water conservation you are promoting, Jesse will come to you.

APRIL 1955

SOIL CONSERVATION

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SOIL CONSERVATION•

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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SERICEA SAVED SITUATION.—B. D. Sheppard, Route 1, Liberty, S. C. has established about 6 acres of sericea lespedeza on 4 water-management areas during the past 2 years as a part of his soil conservation plan with the Pickens Soil Conservation District. Recently, while helping the SCS technician survey terrace lines to drain water into these areas, Sheppard remarked, "The sericea hay which I have cut from these areas has enabled me to feed my six cows. If it had not been for the sericea I would have been forced to sell them." Despite the dry weather, Sheppard secured two cuttings of hay, averaging 2½ tons from this stand of sericea last summer.

PAN AMERICAN DAY.—Sixty-five years ago the First International Conference of American States met in Washington and gave substance to Simon Bolivar's dream of a league of American nations. The International Union of American Republics which this conference created in 1890 evolved through the years, and with different names, into the Organization of American States, whose 65th birthday we will celebrate this coming Pan American Day—April 14, 1955.

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—It is in the spirit of Easter that we depart from winter snow scenes and present John Owen Huffman and his pet lamb this month. The photograph was made at Bridgewater, Va., by a talented member of the photographic pool of the Department of Agriculture.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Here Still is a Land Primeval

On the ancient mountain range of a vast wildlife refuge grow the lush grasses and noble animals that once characterized the romantic West. This is Nature's own scenic classroom for historians and conservationists.

Four range sites in excellent condition class, Wichita Mountains Wildlife Refuge.

By B. W. ALLRED

THE Wichita Mountains Wildlife Refuge is an outdoor conservatory of native American wild animals, longhorns, and bluestem grasses, that is being used for maximum public benefit. The area is small considering the good it yields over a vast surrounding territory. So little of our land has either its original fertility or plant cover left that we need places like this to give us a true perspective of the goal of nature and the potential yielding power of land.

The refuge lies in southwestern Oklahoma, north of Cache, immediately west of the Fort Sill target range and northwest of Lawton. In describing this area, Ernest J. Greenwalt, refuge supervisor, says:

"Its oak-covered granitic hills, interspersed with parks of bluestem grasslands and studded with a score of lakes, encompass 59,099 acres of the ancient Wichita Mountain Range. It was the ancestral home of the Wichita Indian tribe; Spanish adventurers and miners are said to have explored its rocky ridges and crevices for precious metals; and tales of buried treasure and bandit loot in its borders still persist. Generals McClelland, Scott and Sheridan of Civil War fame campaigned in the Wichita Mountains against roving bands of Kiowa and Comanche Indians; and Quanah Parker, last chief of the Comanches, made the mountains his home.

"In 1901 when the Apache, Kiowa and Comanche reservation was thrown open to settlement the area now comprising the Wichita Mountains Wildlife Refuge was set aside by

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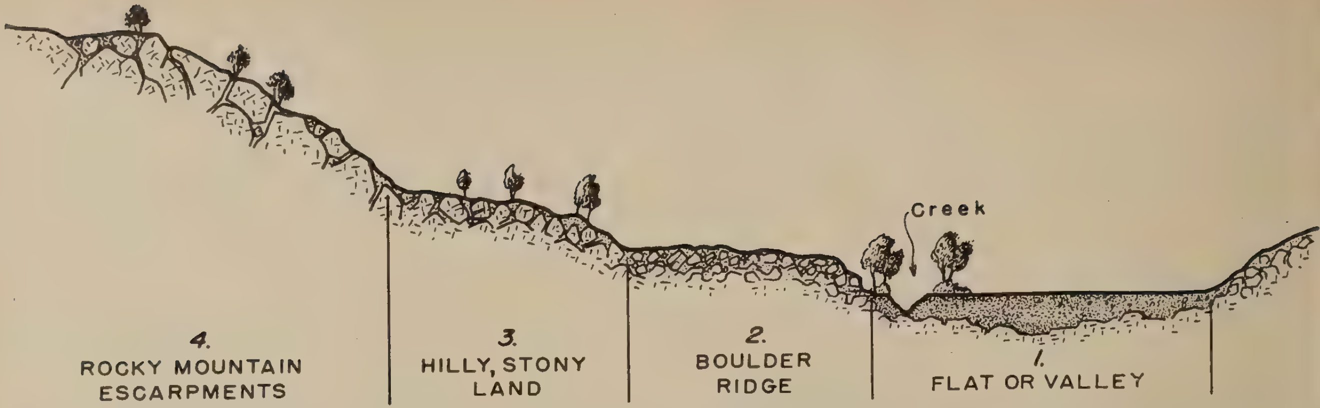
Note.—The author is soil conservationist, farm and ranch planning branch, Soil Conservation Service, Washington, D. C.



When each site is in excellent range condition, it requires about 6 to 8 acres of flat or valley land for a cow to thrive. Some 10 to 12 acres are required on the boulder ridge site. Twenty to 25 acres are needed on hilly, stony land. And 40 to 50 acres per animal unit yearlong must be allowed on the rocky mountain escarpment. Therefore, land buyers can afford to pay 30 percent more for the flats or valleys than for boulder ridgeland, for example.

Sites do not always lie in the exact order shown here. Their positions vary, and the rocky mountain escarpments or the hilly, stony land may be in contact with the flats.

presidential proclamation of President Theodore Roosevelt as a national forest. In 1935 administration was transferred to what is now the Fish and Wildlife Service, Department of Interior."

The Wichita Mountains represent the eroded igneous roots of a former extensive mountain range that was originally much higher than that at present. These mountains appear to have arisen during that prominent mountain-making epoch that began with the uplifting of the Ouachita Highlands on the east and subsequent development of the Arbuckle Mountains, then the Wichitas, and finally the Amarillo Mountains to the west which completed the final phase of the crustal displacement. The Amarillo Mountains are still buried under several hundred feet of sedimentary deposits. They are about 500 feet above sea level and are the lowest of this series of related mountain developments.

Visitors to the refuge find the Texas longhorn cattle one of the features of most interest. These Wichita Mountain longhorns are the lineal descendents of Spanish cattle brought into Mexico in 1521 by Gregario de Villalobos, the first to import cattle to the New World.

The first Texas longhorn cows mothered the foundling range cattle industry. Texas grassland was the great nursery from whence came the bulls and she-stock that founded the Western cattle kingdoms. It has been estimated that 10 million longhorns were drained off the Texas ranges and driven up the north trails from 1866 to 1890. In the Northern Plains they fattened on the fresh deep grass left by the vanishing buffalo and other big game. Then the transcontinental railroad crossed the cattle trail. Feeder lines tapped the producing areas. The northward drive ended. Livestock moved by train with greater speed, safety and economy.

Through the years the longhorn blood became diluted with English and Brahman cattle; the physical signs of the longhorn ancestor are a rarity in today's stock. But the longhorn, nevertheless, has left an indelible stamp on the economy and culture of the nation.

The lasting fight to subjugate the cranky, armored longhorn critters made heroes out of cowboys. The cowpuncher for half a century and more has enjoyed one of the most romantic reputations in the world. A tamer breed of cattle would never have given rise to the stockhand's glory. A more domestic spirit than the usual cowhand possessed could never have battled successfully with the longhorn, though. Just the telling of the cowboy's story—in song and story, art and movie—now exceeds in value, each year, the sale value of the trail herds delivered from Texas to Montana in the best year the longhorn ever enjoyed.

The slab-sided longhorn was well gaited for quick self-delivery from Texas breeding ground to northern grass. He was slow maturing and when slaughtered he was still ornery enough to turn off a minimum of the choicer cuts. Stockmen soon found that the English bred bulls crossed with longhorn cows advanced maturity and beefiness per animal. By early 1900 the longhorn blood was nearly cancelled out by intensive crossbreeding.

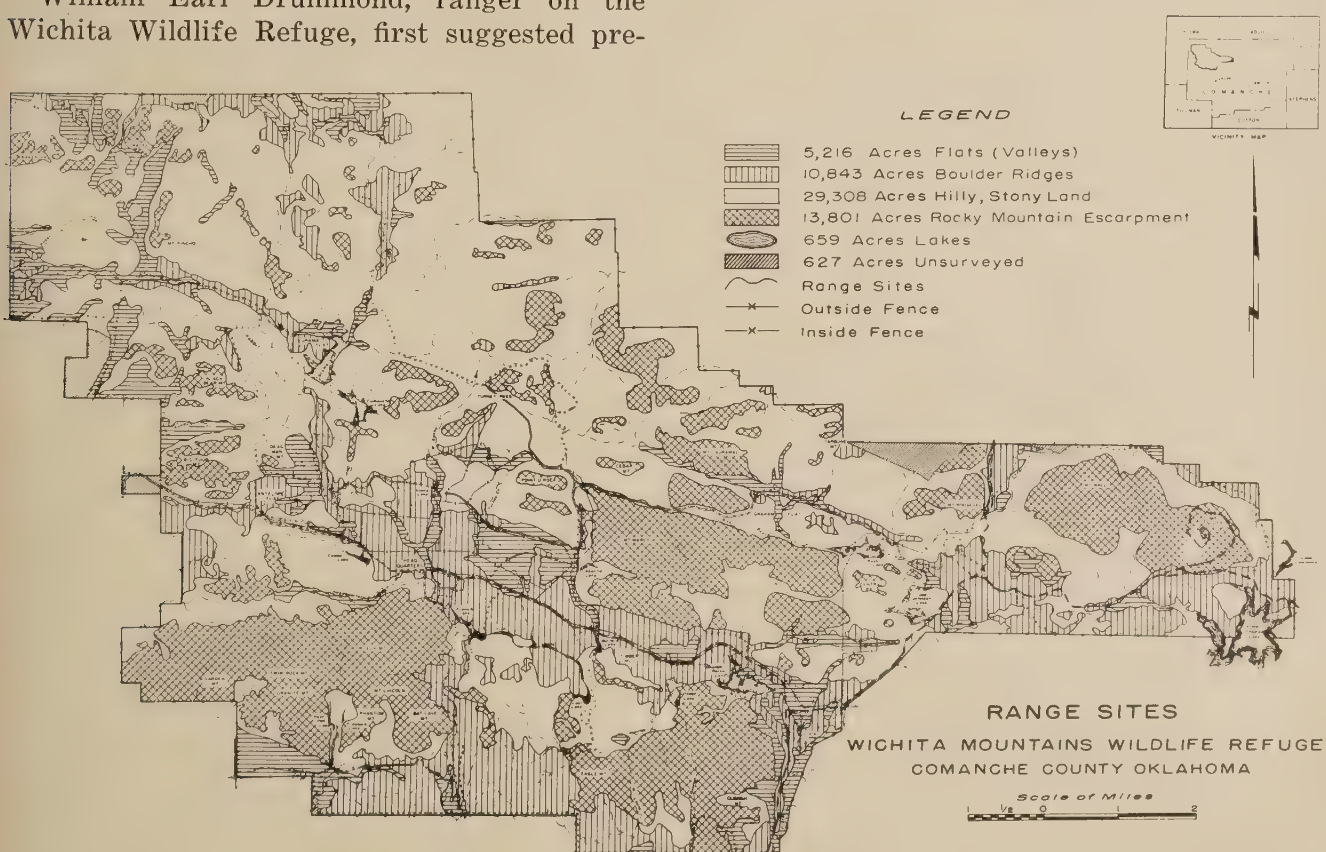
Longhorns and buffalo were predestined for extinction by different methods—one by the breeders art, the other by hunting. Both animals are intensely American. It would be hard to say which is the more so. It's fitting that in at least one place the two are preserved together. The United States is indebted to a few far-seeing and philanthropic men for perpetuating a fragment of these colorful animals before they forever became extinct. A herd of 20 cows, 3 bulls, 3 steers and 4 calves was gathered from many sources and delivered to the Wichita Mountains Wildlife Refuge, north of Cache, Okla., in August 1927. Since then the herd has been increased to 289.

William Earl Drummond, ranger on the Wichita Wildlife Refuge, first suggested preserving the Texas longhorn to his old friends, Will C. Barnes and John H. Hatton of the Forest Service. The latter two tried for 10 years before they got the money to assemble the small longhorn herd that finally was unloaded at the Cache railhead. Senator John B. Kendrick, of Wyoming, a former Texas cattleman, had heard their pleas and persuaded Congress to buy the cattle.

Barnes and Hatton looked at more than 30,000 head of cattle on a 5,000-mile trip along the thorny thickets of the Rio Grande and the Texas Gulf Coast salt marshes and backwaters before they found the individuals they figured qualified for foundation stock.

In 1927, when the longhorns were brought to the refuge, there were a good many bison, many elk and deer, wild turkey and numerous small native birds and animals.

Today, according to Ernest Greenwalt, there are 985 buffalo; 293 Texas longhorns; 1,100 deer, 300 elk, 20 antelope, and about 300 turkeys on the refuge. The smaller native animals are gray foxes, bobcats, coyotes, racoons, skunks, squirrels and many others.



The refuge supports the equivalent of over 1,200 animal units of grazing each year in big game and longhorns alone. That's about 50 acres for a grown cow per year. More than 70 percent of the refuge is rocky, hilly land, inherently low in grazing capacity. The rest is highly productive bluestem range.

Even though the range condition of the refuge was considerably higher than that of the surrounding country, Greenwalt was interested in improving it. The Wichita Wildlife Refuge began cooperating with the Comanche County Soil Conservation District, to the advantage of both.

Since the refuge had such unequaled resources for specialized training, the Soil Conservation Service was granted permission to use the area for training rangemen in Oklahoma and from adjoining States. As part of the range training program a survey of range sites and conditions was made and used as the basis for planning the conservation program on the refuge. The survey provided information on soil, vegetation, water, roads, trails, fences and other items required for sound conservation planning.

Grading ranges according to site variations and range conditions helps landowners tell how good a range is and how much better it may become under correct treatment of sites in line with their potential to produce forage and protect soil. The picture with the white longhorn in foreground illustrates the pattern of range sites on one area in the Wichita Mountains Wildlife Refuge. It should be considered in connection with the diagramatic profile of the sites on the same refuge.

Bull elk with full rack of horns, on excellent-condition bluestem on valley site.

Range sites were named and vegetation and soil units listed for each. Site names used for the Wichita Mountains Wildlife Refuge were the ones used by the refuge personnel. Four range sites were delineated and described as follows:

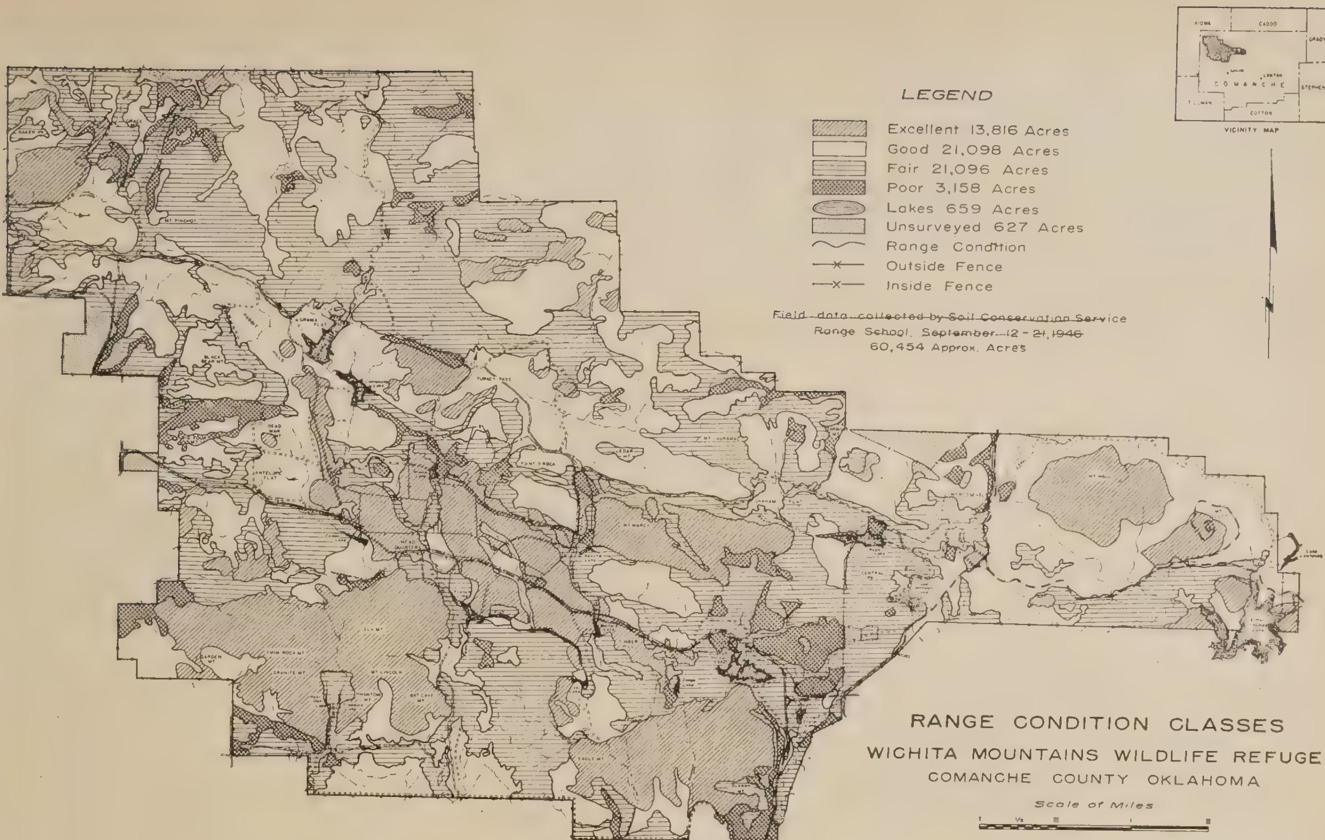
Site 1, Flats (valleys) is characterized by smooth, nearly level productive valley-fill material. The textures included are both fine and medium, largely silty clay loams and silt loams. These soils are productive, alluvial, and of valley-fill origin developed from igneous materials.

This site generally has been grazed the most of all. Animals concentrate here and all of it is readily accessible to livestock. Also, most of this site is being, or has been, heavily used by prairie dogs. It is covered with an over-story of scattered mesquite trees in the higher flats and post-climax oak and elm trees along the creeks. The understory of grass and forbs varies, and includes such plants as little bluestem, sideoats grama, hairy grama, big bluestem, Indiangrass, switchgrass, Canada wildrye, and legumes on spots in better range condition. Ragweed, annual threeawn, blue grama, buffalograss, red threeawn, and gummy lovegrass are common on ranges in poor condition.

Most of this site is in fair range condition, considerable is in poor condition, and small amounts are in good or excellent condition.

Site 2, Boulder Ridge is characterized by very shallow stony soils that occur on narrow ridges or hogbacks. The soils are of granitic origin and largely sedimentary on these sites. Natural productivity is relatively high.

The vegetation is largely open grassland with such plants as little bluestem, sideoats grama, hairy grama, and big bluestem predominating with lesser amounts of Indiangrass, switchgrass, Canada wildrye, blue grama, legumes and asters. However, parts of this site are covered with brushy oak vegetation, principally blackjack and post oak with a thin understory of the grasses just named.



Site 3, Hilly, Stony Land, is characterized by rather steep, stony land of gentle to moderate slope. The soils are granitic in origin, and large boulders up to 6 feet in diameter are common. Approximately half of the refuge is of this site. The potential productivity of this site is low.

Range condition is mostly fair to good, due to relative inaccessibility. Small amounts are in poor condition. Some is excellent. The vegetation is dominated by little bluestem and hairy grama with lesser amounts of sideoats grama, blue grama, fall witchgrass, hairy goldenaster, goatweed, and fineleaved thelesperma. Almost three-fourths of this site has a thin to heavy overstory of post oak, blackjack, and redcedar.

Site 4, Rocky Mountains Escarpment, is characterized by rough, stony land, rock ledges, and slopes that are steep to precipitous. Elk Mountain and Mt. Scott are typical of this site with very thin soils and a high percentage of bare rock.

The potential productivity of such land is low, but because these areas are not readily accessible to livestock use, many are in good to excellent range condition.

The principal vegetation is little bluestem and hairy grama, with small amounts of fall witchgrass, sideoats grama, big bluestem, post oak, blackjack oak, and redcedar.

Ranges were graded into distinctive sites to help determine their potential values. Each one has a slighly different maximum or climax plant community, partly in terms of kinds of plants but largely in terms of productivity. On the refuge only the boulder ridge site can be classed as mature or climax site. Here the soil and vegetation are in equilibrium with the climate. The flat or valley site has superior water relationships and hence is better than the climax site, as is denoted by the greater abundance of the tall grasses and productivity. Number 3 and 4 sites are on steep rocky land that is basically inferior to the boulder ridge site. However, sites 1, 3, and 4 are in reality stable sites, and hence each also has its potential or maximum plant community which is to be called climax for the purpose of classifying ranges according to condition. On sites that

are properly grazed, plants are maintained in excellent condition, but under improper grazing they degrade to low poor condition, with the rate of degeneration in ratio with the intensity of overuse. Between the top of excellent condition and low of poor, or low annual weed stage, are the intermediate grades of good and fair. Each of these is typified by a certain plant community which indicates its particular rank in the plant succession scale. See the accompanying table.

The climax plants for each site were first determined from relict areas and well managed ranges. The climax then became the base point from which range-condition classes were keyed. Once the climax was determined, the classification of the four range conditions was developed by properly cataloging climax plants that decrease or increase and those that invade. Several classes could have been segregated at any point along the plant succession scale. However, for simplicity in classifying range conditions, the plant succession scale was graduated into four equal divisions as follows:

Excellent—75 to 100% of plants are climax species.

Good—50 to 75% of plants are climax species.

Fair—25 to 50% of plants are climax species.

Poor—0 to 25% of plants are climax species.

In classifying the range-condition classes of each site, the plant composition was deter-

Key climax plants: by sites, and other plants that invade with overgrazing

Climax plants	Site 1	Site 2	Site 3	Site 4	Invading plants
Little bluestem	....	....	....	....	Annuals
Big bluestem	....	....	....	....	Mesquite
Switchgrass	....	....	....	0	Silver bluestem
Perennial sunflowers	....	....	....	....	Texas greenthread
Sideoats grama	10	10	15	....	Red threeawn
Meadow tall dropseed	10	5	0	0	Windmillgrass
Buffalograss	Inv.	Inv.	5	5	Tumblegrass
Hairy grama	Inv.	Inv.	5	10	Ironweed
Blue grama	5	Inv.	10	....	Western ragweed
Purple threeawn	Inv.	Inv.	5	10	Prairie coneflower
Woody vegetation	5	....	....	....	
except mesquite	....	5	10	20	

Range conditions	Safe stocking rate; acres per animal unit				Percent original vegetation
	Site 1	Site 2	Site 3	Site 4	
Excellent	6-8	9-12	25-30	35-40	75 to 100
Good	10-12	12-16	32-40	36-54	50 to 75
Fair	16-18	18-25	50-60	70-80	25 to 50
Poor	25-30	40-50	100	140-160	0 to 25

Legend:

0 = None or only traces in climax (all allowed).

... = Decreaser; unlimited in climax.

5-10 = Plant is an increaser and the number shown in each site gives the percent found in the climax; more than the amounts indicated do not count in the climax.

Inv. = Plant invader on this site.

mined. The percent of key climax and invading plants was tabulated as indicated in our table. The pattern of land sites and range condition classes for the Wichita Mountains Wildlife Refuge are shown on the two maps. Excellent, good, fair and poor range condition for a valley site are shown in four photographs.

Valley site, fair range condition class. Grazing capacity 15 to 17 acres per animal unit yearlong. Climax plants make up 25 to 50 percent of the vegetation.

The refuge's largest single conservation need is grassland conservation because most of the land is covered with native grass. Refuge personnel are accomplishing this need through proper stocking of game animals and longhorns and fencing and salting for better distribution plus fire prevention and control. Annual

Valley site, excellent range condition class. Grazing capacity 6 to 8 acres per animal unit yearlong. Climax plants make up 75 to 100 percent of the vegetation.

sales of game and cattle are made to help keep grazing animals in balance with yearly grass production. Ranges that were in poor and fair condition have been improving for 20 years.

There are some pesky types of erosion prob-

Valley site, poor range condition class. Grazing capacity over 30 acres per animal unit yearlong. Climax plants make up 0 to 25 percent of the vegetation.

lems to which the men have to be constantly alert. For example, there are many miles of dirt and hard surfaced roads which collect water to form gullies. Much of the muddy water that drains from road ditches originates on steep, unprotected road cuts. A large acre-

Valley site, good range condition class. Grazing capacity 10 to 12 acres per animal unit yearlong. Climax plants make up 50 to 75 percent of the vegetation.

age in camp grounds and parking lots is kept bare by shoe and tire wear. The packed soil sheds rainwater, and erosion becomes a serious problem.

There has been considerable success in starting native grass to growing after planing down the steeper road and gully banks and covering bare slopes with seed hay. Logs for contour berms are used to control erosion on camp sites; bermudagrass sod held in place in sacks grows quickly and converts gully bottoms into sod flumes that carry runoff with minimum destruction. Patching breaks is a continual job, but progress is being made. Eighteen hundred plants of multiflora rose have been planted for wildlife cover.

(Continued on page 216)

Many Groups Make District Run

By HUGH F. EAMES

SMOOTH running, sure-fire soil conservation districts aren't created overnight. It takes years of hard, steady effort under positive leadership to bring a soil conservation district to the point where it consistently accomplishes its mission.

Along the shores of Lake Ontario, in western New York State, Wayne County Soil Conservation District stands out in the midst of a highly diversified agriculture. There it demonstrates, perhaps more than any of the State's other districts, just how steadily mounting results have rolled in from painstaking and thorough early spadework.

Preliminary work began in 1942 in discussions at Grange, Farm Bureau and other farm organization meetings. Out of information reported back to farm organizations and the county board of supervisors, the Grange, and the Farm Bureau requested the supervisors to declare a district. It was done by almost unanimous vote, and with this action came a county appropriation of $600 to help the new organization get started. This positive initial attitude was a powerful factor in getting the district off to a sound start, and continuation of this policy has been one of the principal factors in its constant success.

J. D. Ameele, East Williamson, representing Farm Bureau, was the first chairman. Other members of the district board of directors were: Walter E. Benning, Clyde, representing the Grange; Harry Walters, Newark, at-large; Wilbur Palmer, Ontario, and Ralph Wilkerson, Wolcott.

In the years that have followed never less than 100, and as many as 282 requests for assistance have been received annually.

As the work spreads out "Jake" Ameele comments that "It looks like we have a busy 10 years' work ahead. We've come a lot further and faster than we had expected."

Through the years Wayne County Soil Conservation District has always had the help of every Wayne organization that could assist in any way—the county board of supervisors, the Farm and Home Bureau and 4–H Clubs, the Grange, the Extension Service through its county agents, the Wayne County Bankers Association, service clubs, town and county highway departments, seed fertilizer and farm machinery dealers, contractors, churches, schools, newspapers, radio stations and theatres, organizations of sportsmen, vo-ag teachers and pupils, GI farm training groups, and railroads.

Some of Wayne's leaders in soil conservation: Sitting—J. D. Ameele, Walter E. Benning, and Leon Van Quekelberg. Standing—Sidney C. Lookup, Harry S. Sergeant, and the technician, Richard C. Saunders.

Last year the members of the county board of supervisors got a "once in a lifetime" thrill when an organization came in and asked for *less* appropriation. It was the Wayne County Soil Conservation District, which thought it could get along with $1,300 instead of $2,300 during the next year. The supervisors obliged, but declared "You can have it back, if you need it."

Cooperation of town and county highway

departments is represented in the $5,122 earnings paid to 7 towns in 1944–52 for use of equipment. These extra earnings have helped taxpayers buy better equipment for their road work.

From the state, Wayne County Soil Conservation District had the help of the State Soil Conservation Committee, the state departments of conservation, highways and public works, and the State College of Agriculture.

The Federal government provided cooperation of the Soil Conservation Service, the Agricultural Conservation Program, NFLA's Production Credit Association, and Farmers' Home Administration.

It is this kind of straight-across-the-boards cooperation with Wayne County Soil Conservation District that keeps up a steady flow of new applicants for assistance.

One young Wayne farmer recently took on a $15,000 debt when he launched a land improvement program. He's confident that there is a real future for him in Wayne agriculture and rural life; that he will reach his goal in a few years. It's the same goal that hundreds of other farmers, both old and young, are moving toward with confidence in a sound and well-supported program.

SOCIETY HONORS TWO.—The Society of American Foresters has presented two of the profession's highest awards to William L. Hall and Tom Gill.

Hall was presented the Gifford Pinchot Medal, and Gill the Sir William Schlich Memorial Medal.

A segment of Jake Ameele's contour orchards. What looks like an auto tire is really the Williamson village reservoir. At left center the trees are in bloom.

Everyo

Here is a nationwi ages farmers to i ment by their dist

By A

Happy winners, at Wigwam. Holding signs denoting major specialties: A. C. Edwards, N. C.; T. T. Traywick, S. C.; Orrie Wilson, Nebr.; Berry Miller, Tex.; D. R. Springfield, Ark.; A. A. Welker, Ariz.; J. George Patch, Mont.; Melvin Lerfold, Wash.; and Leon Sheuerman, Kans.

GOODYEAR will continue with its nationwide awards program, starting May 1. 1955 and ending April 30, 1956.

Points are earned toward the annual Arizona trip by doing exactly the things that a soil conservation district board is supposed to do in its role of management.

Soil conservation leaders hold that even those who do not win a grand award will benefit greatly in terms of better-managed soil conservation districts.

This, in essence, is behind the continuing and mounting interest in this awards program, which is channeled through the national, state and local soil conservation district organization.

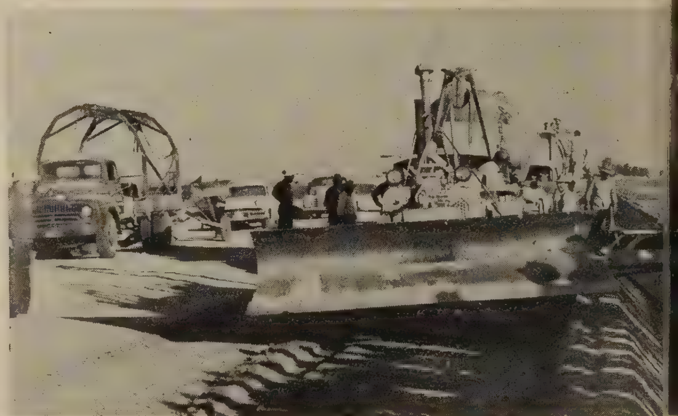
Every district is being invited to enter the current program, even though it has been a top winner in the past.

The Goodyear Tire and Rubber Company's interest in soil conservation district activities originally stemmed from participation in local soil conservation district projects by R. S. Wilson, vice president in charge of sales, after he purchased a farm in Michigan.

Through the combined efforts of the Soil Conservation Service, the Extension Service and other agencies, plus the committee formed by Goodyear, was evolved the first soil conservation awards program early in 1947.

Plaques are presented to boards placing first and second in each competing unit, plus framed certificates of merit to each of the board members. A framed certificate of merit also goes to each outstanding farmer-rancher cooperator as named in the score sheets which the districts send in to the judges.

Fast action here. A r



Guests take a look at cem

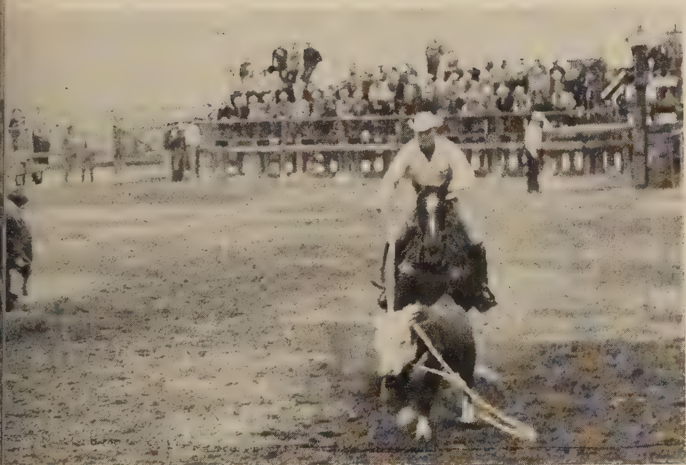
Note.—The author is director, soil conservation award program, Goodyear Tire and Rubber Company, Akron, Ohio.

Wins!

est which encour-
the best manage-
rds of supervisors.

TLE

Eating in the open was one of the thrills enjoyed by victors, December 1954. Big hats and colorful shirts, western belts and levis, were worn as part of their reward for doing topnotch managing of their soil conservation districts. These men came from all parts of the Nation.



ne of the exciting events.

n ditching on company farm.

The grand award, of course, is a week's vacation at Goodyear's Farms, Litchfield Park, Ariz., in December. The first place district in each competing unit selects one of its members to accompany the oustanding cooperator from that winning district.

After 6 years on a gradually expanding basis, this awards program on May 1, 1953 went national, with all 48 states included.

One hundred winners enjoyed the fruits of their efforts as guests at the "Wigwam" last December. By having two men from practically every state, with California housed with Massachusetts and Pennsylvania with Washington, a very beneficial exchange of views was made possible.

Upon arrival at their vacation grounds the winners were furnished with complete outfits consisting of a sombrero, colorful shirts with appropriate tie, western belts and levis. Winners wore these clothes throughout their stay.

The schedule included visiting and discussing the green feeding program, a technique whereby the green feed is cut in the fields and brought to the feeding bins and mixed with other ingredients, so that the cattle do not have to forage for food in the pastures.

(Continued on page 209)

Below: Steak barbecue in Arizona.

Seed for Tomorrow's Grasslands

By C. S. GARRISON

TIMES are changing for the better when it comes to forage crops. Fifteen years ago there were few improved varieties. Certified seed was in small supply and often was priced too high for farmers to buy. Today, however, many farmers are obtaining bigger yields and better quality forage because they plant seed of superior varieties.

Recent experiments have shown that improved meadows and pastures can be made to produce as high a total of digestible nutrients per acre as high-yielding corn crops—and at less cost and less labor. Furthermore, acres planted to improved forage crops help to reverse the downward trend in soil productivity brought on by the intensive use of soil-depleting crops.

Increasingly, we appreciate the importance of our country's billion-acre grassland. The United States Department of Agriculture and state experiment stations have put more scientists to work breeding better varieties and studying seed production. State certifying agencies have expanded to handle a much greater volume of certified seed. Special certification standards have been developed to permit the production of seed in the most favorable seed-growing areas, frequently outside a variety's region of forage usage.

The job of increasing many forage crop seeds presents entirely different problems from those encountered with grain, fiber and oil crops. One difficulty is that grass and legume seed production is of secondary importance in areas where seed grass and legumes are grown extensively for livestock feed and soil improvement. Here, seed yields tend to be low and undependable. Thus, the seed must be grown elsewhere, where the climatic and other conditions are well suited for its production.

Because of these special problems, the maintenance of ample seed supplies for many forage crop varieties becomes a national consideration which calls for the needs and interests of farmers who grow the crops for forage to be coordinated with those of growers who produce the seed. It was to promote such coordination, and to assure adequate breeder and foundation seed, that the work under the National Foundation Seed Project was initiated in 1949.

It is impossible by visual or rapid test to differentiate between the undesirable seed or plants and those of superior varieties. Thus, breeder seed must be fed continually into the seed-increase program. This is the only way to prevent the partial or complete loss of such attributes as disease resistance, winter hardiness, vigor, and other desirable characteristics, as a result of the introduction of impurities. Most species of forage crops are cross-pollinated; this offers one of the serious hazards in maintaining varietal purity in the seed-producing areas where other strains are being grown. Volunteer plants in a seed field can cause changes in the variety. And mechanical mixture occurring during seeding, harvesting, or cleaning is another place where varietal purity can be lost.

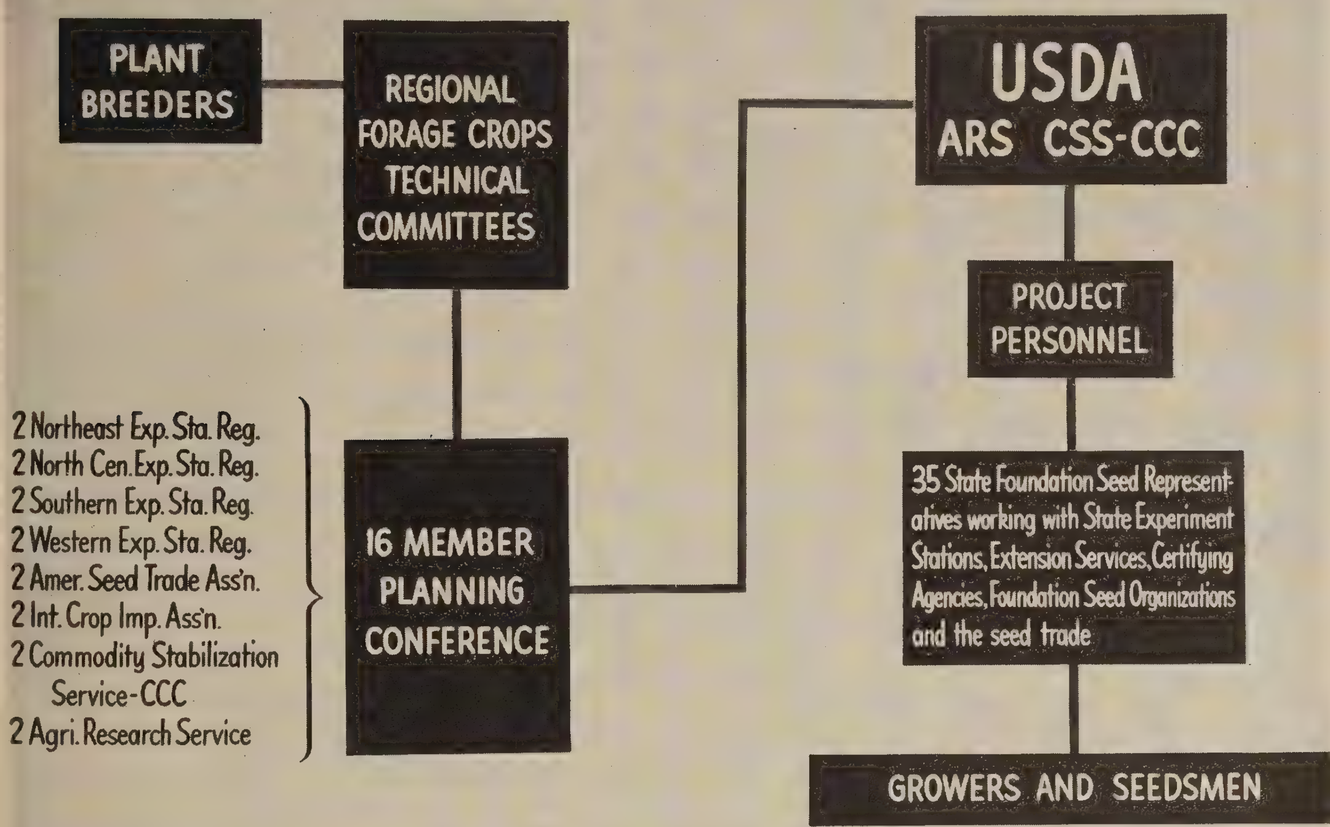
Thus, multiplying a handful of breeder seed of a new forage variety to millions of pounds of certified seed for farm use has its difficulties. Seed buildup in the past has broken down before volume production was reached. The breakdown often occurred in the foundation seed stage. This was either because of

Note.—The author is principal agriculturist, field crops research branch, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

No. 2

This is the second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soils and water conservation.

ORGANIZATION OF THE NATIONAL FOUNDATION SEED PROJECT



failure to produce the amount of foundation seed needed to build up and maintain the desired production of registered and certified seed or because the demand for seed was so great that much of the first increase, instead of being put back into the seed buildup, was siphoned off and used mainly for hay, pastures, and soil improvement.

The Foundation Seed Project represents a new approach. It was shaped to meet the exacting needs of the forage-seed industry. Through the project there has been brought together the facilities of federal and state agencies and of the commercial seed trade in one organized effort to provide farmers with all the certified seed of new and superior strains of grasses and legumes they need.

The Foundation Seed Project is guided by a 16-man advisory committee called the Planning Conference. Its membership represents state experiment stations, the International Crop Improvement Association, the American Seed Trade Association, and the U. S. Department of Agriculture.

The Planning Conference, in turn, is advised by the Regional Forage Crops Technical Committees. There are four such committees in the United States, one in each of the four experiment station administrative regions. The states within each region have similar problems and environmental conditions.

These technical committees recommend to the Planning Conference the varieties to be included in the project, the regions of adaptation for forage and seed production, the estimated certified seed requirements, the areas for the production of foundation and registered seed of each of the varieties, and any other items of value in arriving at a rapid buildup of seed supplies.

All arrangements for seed production within each state are the responsibility of the state foundation seed representative. Appointed by the state agricultural experiment station director, he is responsible for initiating the foundation seed work and handling production details. Actual production is done by growers and seedsmen who are able to meet the state certification requirements.

Officials of the originating station agree to make all breeder and foundation seed of an accepted variety available to the Planning Conference for allocation. Upon recommendation of the Planning Conference, the project personnel allocates the available breeder seed for planting in states best suited for the production of foundation seed. Allocation is based on the previous history of seed production potentialities of a given area, on consideration of the wishes of the originating station and plant breeder, and on other factors which will assure maximum returns for each pound of breeder seed.

The state allotment of breeder seed goes to the state representative. With the aid of the experiment station group that makes stock seed releases, the latter allocates breeder seed to growers and seedsmen who are known to be capable of producing foundation seed. He arranges for production contracts of the foundation seed at a guaranteed price. All growers who receive breeder seed must agree to make available all foundation seed produced to the state representative and, through him, to the Project and the Planning Conference. All of it is assembled and stored in approved warehouses.

Upon the recommendation of the Planning Conference, the foundation seed is allocated to the states. It again goes to the state representative who, working through the local state setup, allocates it to growers and seedsmen for the production of registered or certified seed. Normally, registered seed is distributed by growers or seedsmen as planting stock for the production of certified seed. Certified seed is moved through the normal seed trade channels, since much of it is produced 1,500 miles or more from the consuming area.

Among the better known improved varieties included in the project are: alfalfa—Ranger, Buffalo, Narragansett, Vernal and Atlantic; red clover—Dollard, Kenland and Pennscott; sudangrass—Tift; and lespedeza—Climax. Certified seed supplies of these superior forage crop varieties are larger than at any time since they were introduced. Seed of several of them will be sufficient to meet planting needs in 1955 as a result of the cooperative work by the National Foundation Seed Project.

Altogether, the 1954 production of the five superior varieties of alfalfa is estimated at over 43 million pounds. This compares with a total of around 1.4 million pounds in 1949, when the project started. It is estimated that there are available 30 million pounds of Ranger, 8.5 million pounds of Buffalo; 2.2 million pounds of Atlantic; 2 million pounds of Vernal; and 750,000 pounds of Narragansett for 1955 plantings. These quantities should be adequate to supply about one-third of the alfalfa seed needs in the Northern and Central alfalfa regions.

The success of the Foundation Seed Project in building seed supplies of Vernal alfalfa shows how the time has been shortened between release of a new variety by an experiment station and availability of seed to the farmer. Vernal was approved by the Planning Conference in February 1953. Foundation seed fields were established in Utah and Washington 2 months later. At the end of 6 months there were 9,600 pounds of foundation Vernal. The foundation seed was allotted by the Planning Conference to the states interested in producing seed of this variety. As a result of this cooperative effort, 2 million pounds of certified seed was available following harvest in 1954—only 18 months after the initial plantings were made with breeder seed. In contrast, there were only 1,101,231 pounds of Ranger and 14,568 pounds of Atlantic, 6 and 8 years, respectively, after their release.

Certified Kenland red clover seed supplies for 1955 plantings total about 2.5 million pounds and Pennscott red clover 340,000 pounds. The increase of Dollard red clover will get started this year. It is a new variety, adapted to the Northern States in the Central Region.

The production of large crops of foundation seed the year of seeding is making possible the rapid buildup of certified red clover seed supplies. A 27-acre field, planted in the spring with 21 pounds of breeder Kenland seed, produced over 600 pounds of foundation seed per

acre 6 months later. The following year another seed crop of 650 pounds per acre was harvested making a total production of 34,910 pounds of foundation seed from the field. Thus, for every pound of breeder seed planted there was a return of 1,293 pounds of foundation seed.

Similar results have been obtained with Pennscott. The certified seed buildup of this variety will be rapid, as a large supply of foundation seed is available to registered and certified growers.

Considerable progress has been made toward solving the many problems involved in developing seed supplies of new varieties at great distances from where they will be used for forage plantings. Through the joint efforts of a number of public and private agencies, the National Foundation Seed Project has evolved a system to maintain adequate stock seed of improved small-seeded grass and legume varieties. Farmers in the various parts of the country now have available certified seed of the superior varieties developed by state and federal research workers. These seeds will be used to seed the improved grasslands of tomorrow.

Clem Rozansky makes the most practicable use of 90 acres of "sand-blow-and-drift" land. He expects to harvest his first annual crop of Christmas trees in 1956.

THE CROP GROWS UP.—Clem Rozanski, a tree farmer of Lowville, N. Y., is ready to collect his first income from 44,000 seedlings that he planted in 1944 under his program with the Lewis County Soil Conservation District. He's working with 90 acres that he took over after they became unproductive and were abandoned. He is proving that this sand-blow-and-drift-area, like many others in the upland east of Black River, can be made to yield a profitable crop of trees annually, even if it will not produce row crops, hay or pasture.

EVERYONE WINS

(Continued from page 205)

Many of the guests were interested observers of the irrigation system used and practiced on the Farms.

Also of interest were the conservation practices and harvesting operations. Visits were made to the various crops that were currently growing or being harvested, as well as to the cotton gin and the large acreage of citrus fruit under cultivation.

In addition to all this, inspection was made of the apprentice-farmer development project which was started to give young married couples an opportunity to develop an 80-acre plot of ground and to pay off their land and home mortgages over a period of time out of the proceeds.

Other features were swimming, horseback riding, a steak barbeque, and mountain and desert tours.

Back at their home bases, the vacationists talk up their experiences with enthusiasm, and usually in western costume—give impetus to new and better district accomplishments, and whet interest in the next year's competition.

A Place for Wildlife on the Farm

In Idaho game management is making rapid progress on private lands through the intelligent cooperation of state and federal agencies with soil conservation districts.

The author and his dog.

By ROBERT L. CASEBEER

MOST people think of the 53 million acres in Idaho as a vast area of public land in timber or livestock production. Actually, about a fourth (13 million acres) is in private farmlands. Much of this is in pasture or hay land, but about 5 million acres are used for cultivated crops. Idaho has a wide variety of game species and many of them depend in part, or entirely, on private lands for their existence. Sound statewide game management must, therefore include a program that specifically recognizes the role of private lands in the production and maintenance of game populations.

As in many other states, high farm prices and improved farming techniques have made profitable productive lands from many former submarginal lands. Farming is carried on closer to the fence row, and many odd corners have been converted to crop or pasture production. Such farming has encroached upon what had been considered native wildlife production areas, or at least changed them so that they now support other classes of wildlife. However, we cannot decry farming. It is here to stay, as a part of the economy of man, and wildlife must be geared to it.

Demands for wildlife have nearly doubled in Idaho over the last 10 years. This demand has been for game produced on private lands, as well as that from public lands. With the decline of natural habitat on private lands, there is a need for more effort on the part of game managers to coordinate wildlife production with private land management if these requests are to be met.

To obtain such coordination, wildlife people cannot restrict their activities to the control of game numbers. It is necessary that they concern themselves with game habitat, and with manipulation of the habitat, so as to provide for wildlife in private lands management.

Many of the commonly used soil and water conservation practices provide for the best wildlife habitat possible on cultivated lands as well as on range and woodlands. Too often, however, wildlife is given incidental consideration in the planning and application of these practices. The attitude repeatedly is: "Whatever is left is good enough for wildlife," or, "If it just happens to be good for wildlife, we are in favor of it."

If wildlife is to receive the consideration to which it is entitled some kind of positive action must be taken. It might be that a slight alteration in farm operations, a minor change in a farming technique, or the application of a specific land management practice in an area, would give wildlife the needed opportunity to produce in harmony with the economy and principal land use of the area.

Such proposals cannot be made until wildlife managers familiarize themselves with the land-management practices peculiar to the areas in which they are working. They must then acquaint landowners with the advantages of those

Note.—The author is habitat improvement leader, Idaho State Fish and Game Department, Boise, Idaho.

practices which aid wildlife and with ways and means of using them. Soils, altitudes, climates, water availability, and natural vegetative climaxes make farming practices so diverse that local problems must be dealt with individually on a community basis.

It is virtually impossible for a non-local organization, such as a State game management agency, to work individually with all the landowners within a community or even a sizable portion of them. To develop farmer interest in local programs of wildlife habitat improvement, a game management agency needs some channel through which it can work with groups of landowners.

Wildlife agencies of other states have worked with soil conservation districts in promoting tree and shrub planting on private lands as a program of habitat improvement for upland game birds. But what might be the possibilities for increasing the scope of cooperation to include the management of land and water for all classes of game? If it could be done it might furnish a way whereby we can give more specific attention to the role of private lands in game management. Therefore, the scope of the Idaho soil conservation district was examined to see just how it could cooperate in wildlife conservation, and what advantages it could offer an agency such as the Idaho Fish and Game Department for the management of game on private lands.

It was found that the soil conservation district is the only organization of its kind established for the purpose of helping farmers and ranchers manage their land and water, and that each district is authorized to accept assistance from any federal, state, municipal or private agency or organization on matters pertaining to land and water management. In this capacity a district may request assistance from a state fish and game department.

In other words, a game management agency might be able to assist a soil conservation district in fitting wildlife conservation into the district's overall conservation program. In such a cooperative program the agency's responsibilities need not be relinquished in any way.

With these facts understood, it was decided to work out some type of practical understanding under which the Idaho Fish and Game Department might be able to work through this

A planting of volga wild rye is checked by Charles Haynes, game biologist. This plant does not spread from seed. It provides good bird feed and makes excellent nesting cover.

Farm pond development is one phase of air to landowner and wildlife. This pond has been fenced against trampling by livestock. Shrubs provide cover for birds.

organized group to facilitate wildlife management on private lands, and which would provide some assurance that the land and water conservation program might give more consideration and benefit to wildlife.

Two years ago a proposal for cooperative programs was discussed with the supervisors of two Idaho districts, Canyon and Portneuf. Upon adoption of the cooperative program the supervisors asked that the programs be carried out under a formal memorandum of understanding. These districts then became testing grounds for the new program. Later, after minor revisions had been made, copies of the program and memorandum of understanding were submitted to 15 more Idaho districts for study. Since then 12 more districts—Boundary, Kootenai, Clearwater, Owyhee, Gooding, Lincoln, North Side, Mud Lake, East Side. North Bingham, South Bingham and Bear Lake—have made formal agreements with the Fish and Game Department. Agreements with the West Side, Franklin and other soil conservation districts are pending.

This memorandum of understanding provides for broad cooperative working arrangements between the Idaho State Fish and Game Department and Soil Conservation Districts. It does not spell out specifications for individual work programs. Once it is completed any specific job can be put into operation. The unique feature of the program under this type of agreement is that it opens the door for cooperative work on all phases of wildlife management on private lands within a district and under sponsorship of the district. Besides tree planting, important phases that may be included are farm fish pond development, stream improvement for game fish, wet land development and management for furbearers, range improvement and management for dual use by livestock and big game, development of farmer-sportsmen programs, and cooperative promotion of special conservation events or projects.

To illustrate how a work program may function in a soil conservation district, let's follow through with one Idaho program, such as tree planting:

Each district is notified of the area in which trees can be planted to be of benefit to birds; that within that area the department will furnish the trees and plant them for any project requiring over 300 trees; and that the plantings may be for windbreaks, snow fences, certain

types of woodlots or odd corner plantings. It is also explained that each cooperator must sign an individual agreement with the Fish and Game Department giving assurance that he will do the necessary ground work and maintenance, and give the plantings proper protection. He also agrees to allow a reasonable amount of hunting by sportsmen who ask permission. In turn the department agrees to post all cooperators' lands with "hunting by permission" signs.

Farmers who want trees under this program submit their requests for tree planting assistance to the districts' supervisors. These requests are turned over to the habitat improvement biologist of the Fish and Game Department who contacts the cooperator and works out the planting design and specifications. Usually the Soil Conservation Service technician who assists the district, accompanies the biologist in this initial contact. This provides for the necessary coordination between wildlife and soil and water conservation planning. For requests which do not meet the requirements of the Fish and Game Department, the technician will usually assist the cooperator in designing the planting and inform him of other sources where planting stock may be obtained.

A similiar procedure is used for Fish and Game Department assistance in farm pond development. A district is informed of the type of farm pond permits available and under what conditions fish stock might be furnished. Requests for assistance in designing and building farm ponds come to the district office. The information is turned over to a department fisheries biologist who inspects the proposed site and makes his recommendations. If assistance in building or stocking can be provided, the arrangements are worked out. Here again a high degree of coordination is maintained between the wildlife and soil and water conservation planning activities.

The important thing is that a department man and SCS technician work together on the inspection and recommendations before any project work is started. This is necessary so that all wildlife values are included in the overall original planning and not added as an afterthought. Those afterthoughts are too often disappointing in their results.

Of the many features of the memorandum of understanding, the one which has done most to develop friendly and cooperative relations, is the provision that the supervisors will call one meeting each year for the purpose of reviewing the accomplishments of wildlife conservation in the district during the past year, and to make a definite operations plan for the coming year. It also provides that the supervisors will invite the participation of representatives of local sportsmen's organizations and the Fish and Game Department. These meetings keep district cooperators and personnel posted on district activities and they bring farmers and sportsmen together on a community level for a common cause. Thus far meetings have been held by all districts. Better relationships are developing.

After two years of this program, these are some of the things that have actually been accomplished in Idaho:

1. During 1953, two districts cooperated. In these two districts over 16,000 trees were planted on lands of 21 cooperators, involving approximately 3,600 acres which were opened to "hunting by permission."

2. In 1954, seven districts were cooperating. About 90,000 trees were planted on lands of 95 cooperators, adding nearly 20,000 acres to "hunting by permission."

Les Wyman, farm owner between Sandpoint and Bonner's Ferry, built a pond and stocked it with trout. This is a sample of the recreation he finds in his backyard.

3. A sportsmen's organization purchased a tree planter and gave it to the local soil conservation district for any tree and shrub planting in that district.

4. Requests have been received for assistance in designing farm ponds and department biologists and Soil Conservation Service engineers are working together in answering these requests.

5. Efforts were initiated within one district whereby the department might cooperate with an irrigation company in the proper construction of a new reservoir so that permanent public fishing would be insured.

6. The department and one district cooperated in a demonstration of marsh development. Dragline operations were compared to dynamiting channels for improving production and harvest of muskrats and waterfowl.

7. One district is completing a 28-minute sound and color motion picture on conservation in Idaho. The department is assisting in planning, filming and finishing this film, as well as furnishing some of the materials.

8. The State Association of Soil Conservation Districts stimulated the appointment of a statewide roadside improvement advisory board to the State Highway Department. Because of its interest in wildlife, the association recommended and obtained the appointment of a department member on that board.

9. Annual wildlife meetings have been held in each district. Sportsmen attended and took an active part. Problems were discussed and feature speakers and films were presented. Annual wildlife work plans were made in each district.

Plans are now being made for even more expanded programs within the districts this coming year and for accommodating more districts in the program. There are at present 41 districts in Idaho. Each one of them has wildlife and wildlife problems. At their request, the Idaho Fish and Game Department will cooperate in every way possible.

How does the U. S. Department of Agriculture Soil Conservation Service fit into this picture? First of all, its personnel are highly skilled soil and water management technicians who have been asked by each district to give specialized assistance. An SCS work unit office has been established within each district. The SCS technicians are in continuous contact with most landowners of a district, with the land use practices which are in use or recommended for that district, and they are responsible for designing conservation farm plans.

This year a 2-day training school was held for all SCS personnel in Idaho. Fish and Game Department technicians reviewed management policies and their application to private lands. Techniques for the planning and application of wildlife practices on private lands were discussed and observed in the field. With this basic training in the management of land and water for wildlife, this group of men has been an added help to the department in the cooperative district wildlife programs.

In summary, an improved approach is needed to carry wildlife conservation to the individual landowner. A program of incorporating wildlife in the overall conservation practices recommended and administered by soil conservation districts is one approach to the problem. It is not the complete answer to wildlife management on private lands, but, in Idaho it sure does help.

SPECIAL ISSUE ON CONSERVATION

Soil and water conservation are being featured in the March issue of the *Extension Service Review*, monthly periodical of the Federal Extension Service. Articles written by USDA Soil Conservation Service men are: "Is the Timelag too Long Before You Relay the Results of Research," by Robert M. Salter, chief, soil and water conservation research branch; and "Farm Planning Trials Conducted by Soil Conservation Service and Extension Service in Four States," by A. M. Hedge, chief, farm and ranch planning branch. W. R. Tascher, Extension soil conservationist, wrote "The Land and People—Key Factors in Farm and Home Planning and Development." Dr. E. J. Neiderfrank, Extension rural sociologist, contributed "The Human Side of Conservation." Also from the USDA is one from Farmers Home Administration, entitled "Credit for Soil and Water Conservation." Many other interesting accounts of Soil and water conservation activities are told by State and county Extension workers.

If you do not get the Review in your office, you will find a copy in your nearest Extension office or library.

How to Use Research

By R. Y. BAILEY

RESEARCH is our most dependable source of information. When research information is available, it should by all means be used. Sometimes it will be necessary to adapt research information to conditions on the farm. Sometimes it will be necessary to do some outside reading to keep abreast of available research information.

I know that in farm planning one does not have research information that will fit every situation but there is always something that can be adapted and applied. A technician may, for example, help a farmer decide what kind of vegetation he will plant on certain land. One will not find direct research information that says, "Plant sericea, alfalfa, kudzu, fescue and ladino clover, coastal bermudagrass, Dallis grass and white clover, Pensacola Bahia grass, reseeding crimson clover, or any other specific type of vegetation on field 6." But, it would be an error to conclude that research has nothing to supply.

Let's take a look. Chances are that there have been studies made of culture requirements —such matters as soil preparation; time, rates, and dates of seeding; liming; and fertilizing of each type of vegetation. For example, Richardson studied dates of seeding sericea in cooperative work at Auburn, Ala. Wouldn't a farmer be better off to plant sericea at the most favorable dates indicated by this research than to use some other date?

The Alabama Agricultural Experiment Station pioneered in methods and rates of seeding sericea. The instructions for planting sericea, which the Soil Conservation Service has used with uniform success since 1937, were based on results of seeding studies made at this station.

All of us in the Soil Conservation Service are willing to ask the experiment stations to write the ticket for fertilizing the various crops. Sometimes it may be necessary to adapt results from studies with one crop to some other similar crop, but if their recommendations are followed the crop will grow. That is what we want.

Research in the field of soil and water conservation is not so old as that in some other fields, but there is much useful information available. One need not rely on personal opinion to point out to farmers what erosion losses mean in crop yields. Uhland found, for example, that as the depth of two important Iowa soils declined from around 12 inches to 1 or 2 inches corn yields were cut in half.

Cotton yields on Cecil soil at Watkinsville, Ga., declined in about the same way as soil depth decreased from 8 to 2 inches. Improved rotations increased the yield on the eroded, shallow soil but did not equalize the yields on soils 8 inches deep and 2 inches deep.

I know the research programs at our Southern stations have not included as much work with perennial grass in crop rotations as we would like. Results are neither as plentiful nor specific as they might be. We are, however, not entirely without research guidance in the use of perennial grasses in rotations. Some farmers have been helped to plan and apply rotations based on either tall fescue or Pensacola Bahia grass. These were copied pretty much from rotations in cooperative studies at Watkinsville and Tifton.

That brings me to another of the facts of life. Research will never be able to study every problem in every locality. Take, for instance, the case of rotations based on perennial grass. Research should, and, I am sure, will give us the necessary basic information about such rotations. But we must make the local adaptations through field trials. Field trials, as we now know them, are not investigational in nature. They are *always* based on the results of research work. Field trials are used for the application, adaptation, and testing of research under local farm conditions.

We once considered field trials as investigations. We required that other agricultural agencies be brought into their planning. This system was too complex to be practical. We spent too much time consulting people, largely to comply with the required procedure.

Note.—The author is research liason representative, Soil Conservation Service, Auburn, Ala.

Under our present concept, field trials are tools to be used in application of research results under farm conditions. Responsibility for such field trials rests on the Soil Conservation Service. We may seek needed help from research and extension people in planning and in evaluating the results. We want to do so on a sensible, working basis that will help us do a better job. We are not required to follow any fixed step-by-step procedure.

Sometimes we have local problems on which research is neither in progress nor in prospect. Where these problems limit the effectiveness of the field program, we can plan and conduct field tests. And in this situation, the tests do become investigational in nature. We need the help of other agricultural agencies in planning them and in evaluating the results. Here again, no fixed, step-by-step procedure is required.

The general policy of all state conservationists with whom I work appears to be to use both field trials and field tests judiciously. They will approve the use of either only when they can see that there is a definite need and an opportunity to strengthen the field program. In my opinion, this is as it should be.

Through the medium of research needs reports that are formulated in each state office, in the office of the research liaison representative, and in the Washington office of the Soil Conservation Service, we are telling the Agricultural Research Service what we believe our research needs are. I am confident that this is going to have a good influence on the entire research program in soil and water conservation. This procedure is already showing signs of strongly influencing the research planning of several state agricultural experiment stations.

Another important responsibility of people in research agencies is to make their results available to technicians in the field. Steps are being taken to get more information channeled from research agencies to the users.

With a soil and water conservation research program that is tailored to fit our needs, and a steady flow of useful information from research agencies to field workers, we may expect an even better program out on the farms in soil conservation districts.

LAND PRIMEVAL

(Continued from page 201)

This refuge is a large area of grassland with associated wildlife that comes near to simulating primeval conditions. On part of it there is evidence that some of the plant cover was damaged in the past, but now there are obvious signs that the present care and management is being rewarded.

Being able to see this area helps give people a true vision of the power and potentiality of land when it is prime and flourishing. No one can remember when our land was in its virgin bloom. We need but look at an area like this to have something on which to sharpen judgments and refine our ideas about land. We have tended to underestimate the high goal of nature. There are too many people who still believe that buffalograss is the best kind of grass for this area. Little bluestem and sideoats grama should play the ranking role on this land; and when they are grazed out and buffalograss takes over, it is a sign that tragedy has set in. It means that the land has lost some of its power to produce forage and litter. Plants advertise the condition of the land and those who use them should know which ones indicate danger and which ones signify healthy conditions so they can improve their land management.

It is necessary to be able to recognize the early and subtle signs of range deterioration without having to wait for the more tragic signals such as weeds, mesquite and gullies to warn us of what is happening to good land, soil and grass. Our prime responsibility is to disseminate to those who need it the useful information that has been learned through research and ranch experience. Our job, then, is to help multiply the ranks of active conservation farmers and ranchmen.

FORESTRY AWARD.—Two students of the University of Washington College of Forestry have been presented the Paul H. Johns, Jr. Memorial Award. This award, consisting of $200 each to the outstanding junior and senior of the preceding year's forestry class, was established in 1943 by the Tacoma Lumbermen's Club. This year's recipients were Robert H. Donnelly and Marvin Jack Burks.

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SOIL CONSERVATION

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
CHIEF, SOIL CONSERVATION SERVICE

ISSUED BY SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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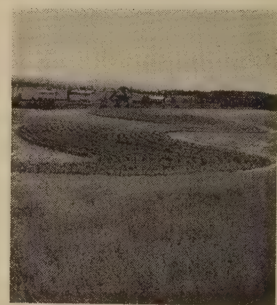
SALUTE!—Diners on the Seaboard Air Line Railroad recently were greeted with a back cover on their menus dealing with soil and water conservation. "Through your window you have seen dust storms . . . fields slashed by gullies . . . cut-over, burned-over forests . . . denuded ranges . . . and swollen, soil-laden rivers spilling destruction across the lowlands."

The article was headed: "We Salute America's 2,600 Soil Conservation Districts."

The page concluded with the statement: "Soil conservation is good business."

LOSSES UNDER CULTIVATION.—J. L. Doughty and coworkers have reported that the brown soils of the prairies of western Canada lose organic matter and nitrogen rapidly when in cultivation. As much as 26 percent of the organic matter and 33 percent of the nitrogen were lost from soils that had been in cultivation for only 14 years.



FRONT COVER. — Alternate contour strips of corn and recently mowed hay crops provide this conservation farming view from the windows of the T. G. Ragsdale home at Brandy Station near Culpeper, Va. Ragsdale, a supervisor of the Culpeper Soil Conservation District, operates the Beauregard Farm, owned by J. C. Miller, of Richmond. Also on contour is the family vegetable and herb garden. The photograph was made by a staff photographer of the U. S. Department of Agriculture.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Ringnecked pheasants are largely limited in Ohio to the grain farming areas. Intensive farming, clipping of grain stubble, high-speed mowers, and lack of nesting cover have contributed to reduced populations. Studies are under way to develop new strains of pheasants better adapted to marginal range and to changed farming conditions.

Managing Wildlife in Ohio

A distinguished biologist speaks out in favor of providing more undisturbed cover on our lands. A prime aim of wildlife management is to create and maintain favorable conditions for fish, fur and fowl production on farms.

By CHARLES A. DAMBACH

DURING the depression years of the early thirties, when thousands of acres of cropland were idle, northwestern Ohio was considered one of the top pheasant areas in the United States. Movie stars made well-publicised trips to hunt there on controlled areas. Officials from nearby states came to see how the "pheasant crop" was produced and handled.

A few years later newscaster Lowell Thomas lauded the crappie fishing in newly created Senecaville Reservoir. Thousands came and caught crappies in abundance, some measuring 17 to 19 inches in length. Then, a scant decade

Note.—The author is chief, Division of Wildlife, Department of Natural Resources, Columbus 21, Ohio.

later, in the midst of a population boom and with less fishing area per angler than any other state but one, Ohio took the lid off fishing restrictions. This action confounded many conservationists the country over and brewed a storm of protest from a very small minority of fishermen in the Buckeye State.

In 1913 William T. Hornaday predicted that Ohio soon would become a gameless state and castigated her hunters, calling them "shooting Shylocks (who) want the last pound of flesh from wildlife." Hornaday has since been proved wrong about Ohio game populations but let no one conclude that wildlife in Ohio is in a state of bliss. It isn't. While some animals are faring well, others—particularly those dependent on agricultural practices—are nearly on the ropes. This article is an account of what the state is attempting to do to maintain wildlife resources for the benefit of all its people.

A picture of Ohio from a wildlife administrator's point of view should help the reader understand this program. The state is small—thirty-fourth in total land area and forty-fourth, almost last, in water area in the United States. But the state is large in population—fifth in the United States. It's eighth in population per square mile; fifth to eighth in the annual sale of fishing licenses; forty-seventh in water area per fisherman, and forty-seventh in land area per hunter.

Most of the land area, 85 percent, is in farmland. Nine percent of this farm area is in woods. Four percent of Ohio is in cities, towns and highways. There are 3 million acres of forested land representing 11 percent of the total land area. This is mostly in the hilly eastern and southern part of the state. During the last 35 years there has been a notable loss of land capable of supporting wildlife and a 300 percent increase of sportsmen. Our population is still increasing at the rate of 2 percent each year. Most of the impounded water in the state, 96 percent, is manmade and subject to intensive use for domestic, industrial and agricultural purposes. Many of the natural streams are seriously polluted with silt, industrial and chemical wastes.

On the bright side is a fauna of great variety. Some 700 kinds of animals have been reported from the state throughout its history. Of these, a good variety are abundant enough to provide pleasure to the fishermen, hunter and nature lover. Some have long since vanished and others have occurred but rarely. Several species—notably the cottontail rabbit, bobwhite quail, the introduced ring-necked pheasant, muskrats, raccoon, a host of field birds and small mammals, pond fishes like the bass and crappies and bluegills and catfishes—undoubtedly are more abundant than when the state was first

Thousands of farm ponds have been built by Ohio farmers in cooperation with soil conservation districts. The Division of Wildlife has provided thousands of woodchuck boxes to make the ponds habitable to these colorful birds.

settled. Some species once vanished are making a comeback; notably beaver, whitetailed deer, ruffed grouse and the recently reintroduced wild turkey. These animals have demonstrated remarkable capacity to live in face of constant pressure by man, his dogs and cats and his farm machines.

To this complex problem should be added the fact that Ohioans, with notable exceptions, are remarkably well informed on the basic principles governing the welfare of wild animals, are remarkably tolerant in their demands, again with notable exceptions, and have provided wildlife administrators with a politically free governmental organization to manage these resources. And there are reasonably adequate funds (derived solely from hunters and fishermen) to carry out its program.

The hub of Ohio's wildlife administration is a 9-man bipartisan program—and policy-making council. Five of the men serving the council own and operate farms. These men have adopted an operating program which recognizes that—

1. Wildlife belongs to all the people and is held in trust by the state for their benefit. Approximately a million persons participate directly in its use through hunting and fishing alone.

2. Wildlife has great economic, biological and aesthetic value. In Ohio its use creates business activity aggregating approximately $100 million annually and provides employment to approximately 20,000 persons.

3. For the most part, in this intensively farmed, heavily industrialized state, wildlife is an incidental byproduct of land and water use for farms, factories and cities.

4. Costs of producing wildlife, whether by the most efficient methods in hatcheries or by developing habitat, are considerably greater than the cost of producing a comparable unit of domestic livestock. The cost is also in excess of income from hunting and fishing licenses.

5. Successful wildlife production is largely dependent upon practices which fit into management of land and water for crop production, domestic or industrial water supply or timber production.

6. There are real conflicts occasionally between Ohio landowners and sportsmen. Most of the conflicts are social rather than economic and most are subject to solution by reasonable people.

Ohio's goal of a balanced wildlife population for enjoyment of the people is not unlike that of other states except, perhaps, in emphasis on those efforts necessary to meet specific Ohio needs. The essential elements and highlights of this program are as follows:

1. Factfinding. Action has preceded factfinding in wildlife management too often. And too often it has been costly and ineffective. One major effort is to inventory fish and game constantly to establish better the necessary regulations. Fundamental research in both fisheries and game work is subsidized by grants to the Ohio State University and other universities and to creative research undertaken by trained division personnel.

Among the more important of these projects are efforts to develop game birds by long term

Planting multiflora rose hedge on an Ohio farm.

genetic studies to fit the different ecological situations which occur, and a similar program to develop plant material which fits into the farming pattern to the advantage of both the farmer and wildlife. Experimental enclosures are maintained to determine the effects of farming on game and particularly the impact of new practices such as spraying herbicides and insecticides. The plot method of the agricultural experiment station has been borrowed for this type of research and is being widely substituted in this state for the more general observational type of research which has been customary in wildlife studies.

Efforts are under way to develop techniques for balancing fish populations in farm ponds and in the small artificial lakes which are characteristic of our program.

2. Information. Although Ohio has little reason to brag about the size and number of its lakes, the number and size of its public hunting areas, it can and does take pride in the understanding its people have of basic wildlife management. This has not come about by accident but through a persistent effort to keep the public informed of its findings and give it an opportunity to discuss freely and take issue with them. The core of this effort is the annual public fish and game hearing in every county. At these meetings representatives of the state relate the latest findings and answer pertinent questions. Farmer and non-farmer sportsmen are elected to represent the county at a subsequent district meeting where problems of a regional nature are discussed. From this meeting farmer and sportsmen representatives are elected to attend state fish and game hearings, where their recommendations are heard by the Wildlife Council.

The division uses radio, T.V., news releases and a well illustrated Conservation Bulletin. In addition, division personnel are made available to the State Department of Instruction to carry out a conservation program in the public schools and particularly in the vocational agricultural classes. An annual grant is also made to the Agricultural Extension Service to carry out an education program through county agricultural agents, 4H Clubs and extension specialists. By these means the efforts of a few persons are channeled to thousands of classrooms and farmsteads.

3. Management. Managing fish and game is something like coaching a football team from the stands. The coach may know the name and number of every player, have a good team and a good set of plays, but if he isn't in position to direct the play, the ball may take some very funny bounces. Since wildlife is produced largely on land and water used primarily for other purposes, our coaching is in a sense from the stands. Our goal in managing wildlife on such lands is first of all to create and maintain conditions conducive to the manager wanting wildlife present and willing to share its use with others. This is no easy task under our crowded conditions. Despite the irritations caused by a few sportsmen, the great majority of Ohio farmers enjoy wildlife on their farms and willingly share it with those who ask the privilege of hunting or fishing. A study conducted by the division in 1951 indicates that over 60 percent of Ohio farms are open to hunting by permission. An additional 34 percent are open to restricted hunting.

This relatively favorable situation is due, the writer believes, to regulations favorable to farmers. Among these are an enforced law that prohibits hunting without written permission, a late opening of the farm-game season (November 15), short hunting hours (9 a.m. to 5 p.m.), a vigorous educational program urging hunters to respect the landowner's rights, and a recently inaugurated program of acquiring and developing public hunting areas near metropolitan centers. On one of these areas as many as 3,600 sportsmen hunted on 6,000 acres in one day of the 1954 season.

The Division of Wildlife, on the areas it acquires, manages the land under a "farm plan" developed through cooperation with the soil conservation districts, but modified especially to benefit wildlife. Longer than average rotations, with emphasis on long lasting grasses and a minimum of tilled grain crops, feature these plans. Lanes of good wildlife cover connecting cropland, woods, ponds and streams are developed. Wherever feasible, fishing lakes are developed on public hunting projects, thus increasing efficiency in use of the land and assuring better control of the watershed area. Where it is not feasible to develop fishing waters on game lands, lakes are constructed as separate projects.

Ten mobile units are maintained by the Division of Wildlife to aid cooperating farmers. They include tree planting machines, fence building equipment and other tools.

Three new lakes aggregating nearly a thousand acres were constructed by the Division of Wildlife during 1954. These lakes and more like them are planned. To provide good fishing, underwater shelter will be constructed or natural growth flooded. Where it's practical, removal of undesirable fish in the watershed before allowing the lake to fill will be followed. Carefully planned stocking with adapted fishes and regulating the water level are planned. Furthermore, the new reservoirs have built-in structures through which the lake waters can be drained and which hold fish for sorting and restocking when fishing falls off.

Although division-owned and -managed hunting and fishing areas are popular and extremely important, there are not enough of them for our needs. These needs, at least in part, are met by agreements with other land and water management agencies which permit the division to manage the fish and game for public use. The state and national forests, much of the land in Army flood control projects, some of the state parks and lands and waters of the Muskingum Watershed Conservancy District are so managed. Most of the municipal water supply reservoirs in Ohio are under public fishing agreement and are available for year-round fishing.

Ohio farmlands are at once the most important wildlife producing areas and the most challenging management problem we face. Modern farm practices and the tools to put them into effect have reached such a level of efficiency that few wild animals are able to rear their broods successfully on lands in the rotational system or on our well managed pastures. Nesting animals which once escaped the horse-drawn mowing machine by moving into unharvested grain now find the mowing machine following the combine. The broken cornstalks and unharvested nubbins of machine-picked and corn borer infested corn which once provided food and cover all winter now are ground into the land and capped with winter wheat only a few hours after the picker leaves the field.

Fence rows and ditchbank cover, which formerly yielded only to the most industrious of farmers, now wilt under the gentle mist of

"harmless" herbicides applied by a local contractor. The ease with which vegetation can now be brought to ground level, or even prevented from growing, has offset many gains due to conservation measures which restored land fertility. Food without cover is valueless to wildlife and modern conservation farming leaves little cover capable of hiding a rabbit, quail or pheasant over winter or nurturing its brood in summer, however well it protects the soil. Despite these adversities, the only real hope for continued enjoyment of wildlife by the millions of present and future users rests on farmlands.

In Ohio, as in a growing number of states, efforts are being made to get permanent wildlife cover on the land through cooperation with local soil conservation districts. The Ohio Division of Wildlife has executed cooperative agreements with every organized district in the state and assigned 10 technically trained men to a program of wildlife area development on cooperating farms. Through this program there have now been developed on approximately 1,000 Ohio farms areas supporting millions of trees and shrubs, some 220 miles of fence row cover, 6 miles of demonstration woodland border improvement, 280 acres of odd unit development, and protection to nearly a thousand acres of woods.

Obviously, this effort is not enough. It is equally obvious from reflection on the costs that there are not now and undoubtedly will not be sufficient funds from public sources to restore wildlife cover on all farms where it is needed. On the basis of present costs it would take at least $84 million to establish the minimum cover needed on Ohio farms. Under these circumstances we feel that our farm-game efforts must be largely demonstrational in nature. As more economical and more readily accepted wildlife management practices are developed, this situation should improve. Intensive research now underway should reveal such practices at some later date.

The future of farm wildlife in this intensively farmed state is dependent upon more undisturbed cover. Wide corn-row cultivation with inter-planted cover crops, a shift from fall- to spring-grown small grains and greater use of cover crops, such as sweetclover, offer promise for the future.

Wildlife has great reproductive capacity. If agricultural practices of the future are conducive to its welfare, it will thrive and provide hunting and fishing for great numbers of people. If the present trend to manicure every acre with a cutter bar or within reach of a spray boom continues, we can have little hope, regardless of the best intentions and financial resources of any state or federal wildlife agency.

In a time when we are wondering what to do with nearly six billion dollars worth of surplus farm products, it occurs to this writer that a few strands of wildlife cover would improve the landscape, bank some good soil against a future rainy day, restore life where it is now depleted, and perhaps ease the burden of our bulging warehouses.

FACTORS IN DISEASE RESISTANCE.—J. H. Stallings suggests that those genetic factors which impart disease or insect resistance to plants may do so by enabling those plants to produce a more favorable microflora in the soil immediately adjacent to the plant roots. Writing in *Bacteriological Reviews* for June 1954, he notes that the modified microflora in this root area of resistant varieties may be capable of producing antibiotics which destroy or inhibit the disease producing germs, the invading viruses, or the attacking insect pests.

The soil-borne pathogens are destroyed by the antibiotics before they make contact with the roots. Disease germs, viruses and insects attacking the aboveground parts of the plants are destroyed by antibiotics absorbed by the roots and translocated to all parts of the plants in the sap.

BIRD, PLANT AND LAND.—There is a natural affinity between the bobwhite quail, the lespedezas and good land use. And there is one SCS biologist, Verne E. Davison, who is better equipped to write about it than anyone else. As a result, the U. S. Department of Agriculture has just published Leaflet No. 373, "Lespedezas for Quail and Good Land Use." It is a handy, informative 8-pager, attractively illustrated, and available to the public.

Better Tillage for Corn

The author discusses mulching vs. turnplow, rough plowing vs. pulverization, and other practices which bear on the conservation of soil and water and on yields of intertilled row crops.

By W. H. ALLAWAY

SOIL erosion is more of a problem on land cropped to intertilled row crops than on hay lands, pastures, or woodland. For this reason, many conservation farming plans have called for a reduction in row crop acreage. Some farmers have found it difficult to make the reduction in row crop acreage needed in order to bring soil losses down to permissible limits. If a practical way of providing satisfactory erosion control on row cropland can be worked out the job of developing conservation plans and getting them adopted will be much simpler on these farms.

One of the best opportunities to achieve better erosion control in row crops seems to be through use of improved tillage practices. In the Soil and Water Conservation Research Branch, Agricultural Research Service, we and cooperating state experiment stations are making a concerted effort to develop tillage practices that combine effective erosion control with efficiency and high production. Some of the ideas we are working with look very promising, but there are a number of problems yet to be worked out before these practices are ready for widespread use by farmers.

One of the most promising, and yet perplexing, phases of this work is concerned with tillage practices for corn in the Cornbelt, the South, and the East. Mulch tillage, which has worked out well in the Great Plains, has not been quite so successful in more humid areas. In a good share of the experiments where mulch tillage has been compared with conventional turnplow seedbed preparation, mulch-tilled corn has yielded less than corn grown on turnplowed ground. Even so, we still feel that surface mulches of cornstalks or other crop residues merit more attention.

No. 3

This is the third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soils and water conservation.

We know that surface mulches can help cut down on runoff and soil losses. For example, last summer at La Crosse, Wis., soil and water losses from corn grown with a surface mulch of 2 tons of cornstalks per acre were compared with those from corn grown on a conventional (turnplowed) seedbed. During a 2.46-inch rain on June 20, the mulched corn plots lost .03 of an inch of water in runoff, whereas on the unmulched plots .73 of an inch of water ran off. On July 3 another rain of 1.53 inches fell. During this later rain the corn on the bare seedbed lost .29 of an inch of water in runoff, while the mulched corn lost only .02 of an inch. Thus, during these two rains, the mulch saved a total of almost 1 inch of water. Other comparisons, conducted in different parts of the country, give a similar picture of the value of mulch in preventing water losses in runoff.

Furthermore, there is evidence that, under some conditions, a mulch of plant residues can help cut down on evaporation losses of soil moisture. Results from several locations indicate that mulched plots do not dry out so rapidly following a rain as unmulched plots. In North Carolina, a mulch applied at the last cultivation of corn increased yields by 21 bushels per acre for an average of 8 experiments conducted

Note.—The author is assistant head, eastern soil and water management section, soil and water conservation research branch, Agricultural Research Service, Beltsville, Md.

in dry summers, and 5.4 bushels per acre for an average of 10 experiments conducted under more favorable moisture conditions. In Ohio, mulches of manure and straw applied to growing corn have been more beneficial in terms of yield in dry years than in wet years.

In the North Carolina and Ohio experiments just mentioned, the mulch was hauled in and applied to the corn after it was up and had been cultivated. On many farms, however, mulching with hauled in materials is not likely to be practical. Our problem is to develop systems of corn production in which crop residues are kept on the surface right through seedbed preparation and planting operations, and still get the advantages demonstrated in Ohio and North Carolina with hauled-in mulch. Since mulches help to conserve water, and corn yields are often limited by lack of water, it should be possible to develop mulch tillage systems of corn production that will outyield the conventional turnplow practices.

Present evidence points to nutritional difficulties and poor soil aeration as important obstacles in the way of higher yields with mulch tillage. Nitrogen and potassium are the nutrients most often deficient in mulch-tilled corn. In a number of field experiments in eastern United States different rates and placements of nitrogen under mulches are being tested in order to work out ways of overcoming the nitrogen problem. Other studies underway are aimed at developing a better picture of the microbiological processes involved in the tieup and release of available nitrogen in mulch tillage systems.

The potassium deficiencies in mulch-tilled corn seem to be a reflection of poor soil aeration. It is difficult for plants to take up potassium from poorly aerated soils. In an attempt to develop mulch tillage systems with improved aeration of the root zone, practices that provide loose, cloddy soil conditions under the mulch, with only a narrow zone of pulverized soil around the seed, are being worked out. The large voids between the clods may provide better channels for the movement of soil air than the smaller voids found in firm pulverized seedbeds.

In mulch tillage for corn following a perennial grass sod, special precautions are needed in order to obtain a good kill of the sod. A technique called "double cut" plowing has worked well for this purpose in Virginia and New York. In this method a moldboard plow with another share or sweep attached to run behind and about 4 inches deeper than each share of the moldboard plow is used. The share of the moldboard plow is run about 3 inches deep and inverts a ribbon of sod. The deeper share, or sweep, then loosens the soil to about 7 inches, and also helps to hold the upper share at a uniform depth. A "TNT plow" has been a satisfactory implement for this purpose. After the inverted sod has been allowed to lie for about 2 weeks, the land is worked with a spring tooth harrow before planting.

Research on conservation tillage practices for corn is not confined to research on mulch tillage. The scheme of planting in the tractor tracks on plowed ground, without discing and harrowing to pulverize the seedbed, is being compared with other systems of tillage in some experiments. This technique has looked promising in the Corn Belt. Workers at the New York Station have developed a scheme in which the planter follows immediately behind the plow. More information about how well these rough seedbeds will take in water and resist erosion on different kinds of soil is needed. It may be that rough plowed seedbeds will be as effective as mulch tillage for soil and water conservation on some soils.

Engineers at the Iowa Station have recently reported on a system of growing corn on contour ridged rows. This system has a lot of promise for slowly drained soils, and for fields where row layouts can be kept close to the truer contour. It and other systems of tillage for corn are being carefully studied in Iowa by a team of soil scientists and engineers of the Agricultural Engineering Research Branch, the Soil and Water Conservation Research Branch, and the Iowa Experiment Station.

In the attack on the tillage problem, comparisons of different schemes of tillage and residue placement on different soils and at different fertility levels are conducted on field plots. The physical properties of the soil, soil moisture conditions, soil temperature, nutrient uptake at different stages of growth, weed control problems, and root growth are studied, in addition to the yield measurements. Promising tillage systems are further tested on runoff plots where

the losses of soil and water can be measured for each rain. Engineers are working on the machinery problems involved. As a result of this work we hope to be able to write a prescription for the ideal seedbed for corn on each kind of soil.

Research on tillage practices for corn is under way in Iowa, Illinois, Nebraska, Wisconsin, Ohio, New York, Maryland, Virginia, South Carolina, and Georgia, in cooperation with the experiment stations in these states. At many of these locations the projects were started by the Soil Conservation Service Research Division. Progress to date has been encouraging.

The research on tillage for corn is a part of a larger program directed toward improving soil and water conservation through better tillage practices for all crops. In another phase of this research, tillage practices aimed at improvement of compacted soils are being developed. We are also studying the problems of establishing grass-legume meadows, using wide-row corn as a nurse crop and tillage techniques for pasture renovation. Research work now under way shows promise of providing a sound basis for future changes in the tillage practices used by farmers.

Throughout the country farmers are becoming increasingly interested in the progress of tillage research. Commercial implements for some types of mulch tillage are available and already in use on some farms. Soil conservation technicians will be getting an increasing number of questions on tillage practices for corn. On the basis of work done so far, mulch tillage seems best suited to well drained soils that warm up rapidly in the spring. Furthermore, mulch tillage works best at high fertility levels, with a good supply of nitrogen and potash being especially needed. Where the corn follows a perennial grass, the double cut plow technique should be used, or else the grass should be killed by thorough discing, as the first step in seedbed preparation. The residues may interfere with the operation of the planter unless special openers, or some other modification, are used to insure that the seed is placed in firm, trash-free soil.

The goals set for our tillage research on corn are high. Methods of growing corn must be developed that prevent erosion and conserve water, and at the same time give as good or better yields than can be obtained with the practices being used now, with less fluctuation from year to year. Furthermore, the new tillage methods should be economical as far as power and labor requirements are concerned, and suited to mechanized farming. We feel that a good research program can reach these goals and that the chances for real improvement in tillage practices for corn look promising.

GAME AND FISH OFFICERS.—Howard Dodgen of Austin, executive secretary of the Texas Game and Fish Commission, was elevated to the presidency of the International Association of Game, Fish and Conservation Commissioners at the organization's 14th annual convention. He succeeds Harry D. Ruhl, game division chief of the Michigan Conservation Department.

Other new officers are: First vice-president, Bruce Stiles, director, Iowa Conservation Commission; second vice-president, Dr. W. J. K. Harkness, chief of the Division of Fish and Wildlife, Ontario Department of Lands and Forests, Toronto, Canada.

Executive Committee—John A. Biggs, director, Washington Department of Game, Seattle, chairman; Frank Briggs, member, Missouri Conservation Commission; Robert H. Johnson, director, Massachusetts Division of Fisheries and Game; Thomas L. Kimball, director, Colorado Game and Fish Department; W. Winston Mair, chief of the Canadian Wildlife Service, Ottawa; Clyde P. Patton, director, North Carolina Wildlife Resources Commission; Harry D. Ruhl, Michigan; and Ernest A. Vaughn, director, Maryland Game and Inland Fish Commission.

Verne E. Joslin of the Minnesota Conservation Department was reelected secretary-treasurer and Carl D. Shoemaker, Washington, D. C., was named to serve again as the Association's general counsel.

HELP WANTED.—A number of specialists in certain agricultural fields are needed to represent the United States in technical assistance programs abroad. The greatest needs are for agricultural engineers who have had experience in the development and use of farm machinery, irrigation, conservation, and machinery repairs; agricultural economists with marketing, credit, land use and farm management experience; horticulturists, especially those with irrigation and citrus crop experience; animal husbandmen, agronomists, and entomologists.

Interested persons who are qualified by training and a number of years of responsible professional experience in agriculture are asked to submit Form 57, Application for Federal Employment, or write to the Office of Personnel, U. S. Department of Agriculture, Washington 25, D. C. Form 57 may be obtained from first-class and second-class post offices.

These calves are sired by purebred Holstein bulls.

WHEN Wayne (Slim) Wenburg took over the stewardship of 1,240 acres of land on Clear Creek near Clearmont, Wyo., he was attempting to do the thing that many young men in this era fail to accomplish. To start from scratch, with little backing except your bare hands and a willingness to work, has been the stumbling block that many young ranchers with less pioneering stamina have found too big to hurdle. A willingness to sacrifice present pleasures for the benefit of future gains has kept Slim going in the face of declining prices and retarded agricultural markets. His wife, Margie, and son, Andrew, have been a steadying influence that has helped prevent discour-

Note.—The author is range conservationist, Soil Conservation Service, Sheridan, Wyo.

Young Man on a Ranch

This is a story of cows and grass, of patient transition from dairying to beef production, and of careful, long-range, scientific planning.

By **HARLAN N. TULLEY**

Slim talks with Roger Deland, agronomist of the Soil Conservation Service, about the possibilities of harvesting seed from a field of intermediate wheatgrass. Slim uses intermediate wheatgrass, tall wheatgrass, brome, and alfalfa in mixtures for irrigated pasture.

agement from becoming defeat. Andrew is the young man who may some day take over the reins and continue the business of beef production started by his father.

At heart Slim is a beef cattle man. With land and equipment to pay, to enter directly into production of beef cattle was too much to undertake. But Slim believes that if you can't get in the front door, there is an entrance at the back. So he has pursued the policy of producing grain crops to meet expenses, while building up the ranch to produce hay and feed crops and gradually acquiring the beef herd in the process.

Carrying purebred Black Angus cattle on shares one year left him with calves to start the herd. An old horse barn, converted to a dairy barn, provided the facilities to go into the dairy business temporarily. And by breeding the Holstein cows to Black Angus bulls, he got beefy calves. The heifer calves from this cross are being saved to mother beef calves sired by Black Angus. With 12 black calves now produced from this cross and 41 expected this spring, the beef operation is well on the road. Eventually, Slim thinks he will have enough beef production to permit him to drop the dairy end and concentrate on beef produced on native rangeland and irrigated pasture. How long will the transition take? Well, that depends on several things, such as prices of milk and grain, rate of development of irrigated pastures, and other considerations.

In the meantime, a 27-cow dairy herd is producing in excess of 300 pounds of butterfat each per year. The cows are from purebred herds in Wisconsin, and Cache Valley, Idaho. The 1953 average production was 8,822 pounds milk testing 3.7 butterfat, for a total of 326.41 pounds butterfat per cow.

Grain and alfalfa hay raised on the ranch provide the basic ration. About 120 acres of land have been developed for irrigation since Slim took over the ranch. This makes a total of about 300 acres cultivated and hay land. Development has been in cooperation with the Dutch Creek-Clear Creek Soil Conservation District, where the rancher and district representative talk over the needed improvements and decide the order of establishment. Then, the district arranges for technical help from the Soil Conservation Service to lay out the practices.

This field, partially leveled, still has some unevenness, as attested by winding lateral irrigation ditch. It will be leveled further and irrigated by border dikes to achieve maximum efficiency of water use. Note grain stubble left over winter to protect soil. The stubble will be plowed into soil to increase organic matter and build up fertility.

Part of Wenburg herd in windbreak—protected lot used for resting cows prior to milking and at night.

Below.—Equipment used in production of Grade A milk. Sanitation is a prime consideration.

With 60 acres of land in alfalfa, the hay production now meets the needs of livestock feeding. Irrigated pastures are being developed for present and future requirements. About 25 acres in intermediate wheatgrass and 5 acres in Lincoln bromegrass have been supplying summer pasture for several years. A new seeding of 40 acres of intermediate wheatgrass, alfalfa and clover was started in production last year, the seeding being at the rate of 10 pounds wheatgrass, one pound alfalfa, and one pound of red clover per acre. About 70 acres additional irrigated pasture is planned for seeding this spring, in which there will be intermediate wheatgrass with legume on 50 acres, and tall wheatgrass with legume on 20 acres, planted at the rate of 10 pounds wheatgrass and 2 pounds legume per acre. On these new pasture seedings, weeds are mowed while green to keep a clean stand, and only light fall grazing is permitted the first year, so that the root crowns will not be damaged.

About 940 acres of native rangeland make up the balance of the ranch. This is receiving special attention, with the purpose of building it up to highest productive capacity. One reservoir and one pit for stockwater have been built, and another reservoir is planned. New line fences have been constructed and cross fences repaired. The condition of this land has improved from fair to good, as judged by district technicians. This means that proper stocking rates and summer rest have encouraged the taller, more productive grasses to increase and production is now higher than formerly.

Slim figures he now could pasture about 125 head of stock year-round. He would get about 3 months grazing on the native land and the rest on irrigated pasture and feed. The feeding period in this area usually runs about 3 months, which would mean about 125 tons for the period. Eventually, with some 200 acres in irrigated grass-legume pasture and 100 acres in grain, it ought to be possible, he thinks, to build the beef herd up to about 250 head and raise the hay necessary to feed them in winter.

Careful management of irrigated pastures to allow irrigation and grazing in rotation on 4 to 6 fenced pastures can do wonders in forage production. The grass is grazed at its most nutritious stage of growth—quickly, to prevent trampling and wasted feed—then mowed, harrowed, irrigated, and allowed to grow undisturbed until the next grazing period. Fertilization once each spring with nitrate-phosphate fertilizer keeps the grass in top condition for rapid growth. Slim knows this, and is looking forward to the time when he will have the desired pastures seeded and cross-fenced, with black cattle grazing on the lush grass.

With land-clearing, leveling, irrigation development, and pasture seeding going on, in addition to regular farming operations, this ranch is a busy place. At one point on the main ditch where district technicians recommended concrete drops to lower the water to a field head-ditch, Slim went one better. He figured the drops would be expensive and would serve no purpose except to lower the water from one ditch to another without erosion. The intervening land is well sodded in native western wheatgrass, and water would increase the growth of this grass. So he obtained some lengths of 8-inch canvas hose which can be attached to the gate outlet in the ditch and direct water to different parts of the slope. The water drains down the slope and is collected in the head-ditch below. On the heavy sod this procedure causes no erosion and it achieves the purpose of irrigating the grass, thus producing much additional pasture and saving the cost of drop-structures.

Slim is now in his third year as a supervisor of the Dutch Creek-Clear Creek Soil Conservation District. He has relied on the technical advice provided by the district for basic information. The district has provided soils information and engineering help to improve the irrigation by land leveling and ditch realignment, and to improve the heavy soils by crop rotations, stubble mulching, and fertilizer application.

The kind of help that Slim obtained is available to all farmers and ranchers living in soil conservation districts throughout the West, and elsewhere. Many long-established ranches and farms are being improved with this help.

———o———

TO PUSH USE OF LUMBER.—Better Farming Magazine and the National Lumber Manufacturers Association have joined in sponsoring a second nationwide contest designed to spur use of lumber and wood products for farm remodeling and new construction. Cash prizes total $10,000.

Cotton Thrives Following Fescue

Grass-based rotations make progress in Southeast as aftermath of drought experience.

J. P. Anderson, district supervisor, and J. B. Wakefield, technician of the Soil Conservation Service, examining cotton following drought-killed fescue. The cotton made more than a bale to the acre.

By T. S. BUIE

WHEN Joe P. Anderson began planting Kentucky 31 fescue on his farm near Abbeville, S. C., about 10 years ago, it looked as though he "had it made" as far as year-around grazing was concerned.

During the good seasons that followed for several years, Anderson's 60 acres of fescue provided lush grazing for his cattle during late fall, winter, and early spring months when his summer grazing crops such as bermudagrass, annual lespedeza, and kudzu were dormant.

With a winter crop like fescue, there was no need to harvest hay, he figured. And like a lot of other cattle farmers, Anderson was convinced that at last the South had come into its own as a grassland paradise. It was almost too good to be true.

Then came the droughts of 1952-54. Large areas of 2-year-old fescue, seared by the heat and drought of the summer of 1952, turned brown and died. When the rains of late fall and winter failed to revive it, Anderson de-

Note.—The author is state conservationist, Soil Conservation Service, Spartanburg, S. C.

cided the following March to plant 25 acres of fescue land to cotton.

The deep fibrous root system of the fescue sod made the soil a little difficult to turn, but finally this farmer got his land prepared and planted and the cotton came up to a good stand. It grew fast, fruited well, and made the best yields of any cotton in that area during the continuing drought of 1953.

But the dry weather killed off other large areas of fescue on his farm, some of which had been in fescue 5 years or more. Encouraged by the previous year's success, Anderson turned still another 11 acres of this land over to cotton. It was even tougher turning this 5-year-old sod, but he finally got a good job of land preparation done and planted the land to cotton.

Although 1954 was the driest year in more than half a century in the South Carolina Piedmont, Anderson made more than a bale of cotton to the acre on the fescue sod land, compared with half a bale or less on similar land that hadn't been in sod just across the road.

For a good many years, SCS technicians have been trying to persuade farmers to set up grass-based rotations on their pastures. But it was hard to be convincing when the pastures were thriving during good seasons.

But a lot of farmers, including Anderson, have found out the value of grass-based rotations by accident from the damage done by severe droughts. As a result, such rotations are rapidly coming into favor throughout the Southeast.

Anderson pointed out at the annual meeting of the South Carolina Association of Soil Conservation District supervisors early this year that grass-based rotations have other advantages than that of increasing cotton yields.

"We need grass-based rotations to keep the soil in good mechanical condition, which in turn reduces runoff and stores water in the soil. These good effects help to make a better than normal cotton yield during a drought season," he emphasized. "Grass-based rotations also help us to get rid of noxious weeds."

Display of printed material on sprinkler irrigation.

YES SIR, THAT'S OURS!—You'll have to look mighty close, and use your magnifying glass, but SOIL CONSERVATION Magazine—April 1954—is right on the top row in this display of agricultural publications. It's about eleventh from the right, tree and white fence showing—and somewhere in the irrigated pasture is a sprinkler in full spray.

There were 40 feet of material in this exhibition. And the occasion was the annual conference of the Sprinkler Irrigation Association at Boca Raton, Fla., attended by more than 200 persons.

FRIENDS OF THE LAND.—In March the organization known as Friends of the Land will be 15 years old. Its membership is composed of a wide cross section of citizens who feel they must be kept informed about what is happening to land and water and wish to participate in activities helpful in conserving America's natural resources.

In 1955, according to recent announcement, Friends of the Land will engage in the following events:

Watershed Management Clinic, St. Louis, Mo., April 22 and 23.

Conservation Nutrition and Health Institute, Chicago, Ill., June 27, 28 and 29. Cooperating in this are the Illinois Medical Society and Chicago dietetic groups.

Home Acres Clinic, East Bay Camp, Bloomington, Ill., August 31, September 1, 2 and 3. This is especially intended to be of assistance to persons who have moved to a small place in the country where they confront varied problems in a new environment.

Annual Tour of the Muskingum Conservancy District, in connection with the annual meeting of the society, tentatively October 6, 7, and 8.

This is the Valley of Seed

Sugar Beets on Ray Henning Ranch.

By ROY E. BALLARD

THIS is "the Valley of Seed," thinks the traveler as he arrives at the crest of the Tehachapi Mountains via the Oak Creek Pass and gazes down on the panorama below. He marvels at the sight of field after field of many species of plants being raised for seed production on the valley floor. A few miles farther west, the thrill is twice repeated as Brites Valley and Cummings Valley come into view.

Here a group of enterprising men, by efficient methods of operation and tireless efforts, have transformed a desert waste into a productive area. Sugar beets are being grown on contour for seed production on the Ray Henning ranch, 2 miles east of Tehachapi, Calif., and a luxuriant growth of Goars tall fescue on the Grand Oaks ranch. On an adjoining ranch, operated by the Jacobsen Bros., a planting of Akaroa orchardgrass, is observed.

Wide-awake landowners of this section, such as Claude Botkins, Don I. Carroll, Bud Cummings, C. and W. C. Handel, Ray Henning, J. C. Jacobsen, Jr., Jake Ratzlaff, Ben Sasia, and Edward Schnaidt have projected the task of seed growing to a point where it will gross an income of over a million dollars annually.

Akaroa orchardgrass on Jacobsen Bros., Ranch.

Goars tall fescue on Grand Oaks Ranch.

Among the leaders in production are the seeds of Akaroa orchardgrass, Goars tall fescue and Merion bluegrass, also, Atlantic, Narragansett, and Ranger alfalfas.

Note.—The author is work unit conservationist, Soil Conservation Service, Tehachapi, Calif.

Hulling seed after curing in bundles by stationary thresher, Jacobsen Bros. Ranch.

Portable rig threashing sugar beet seeds in Cummings Valley.

Gleanings of seed from Akaroa orchardgrass more than paid the bill for harvesting and threshing.

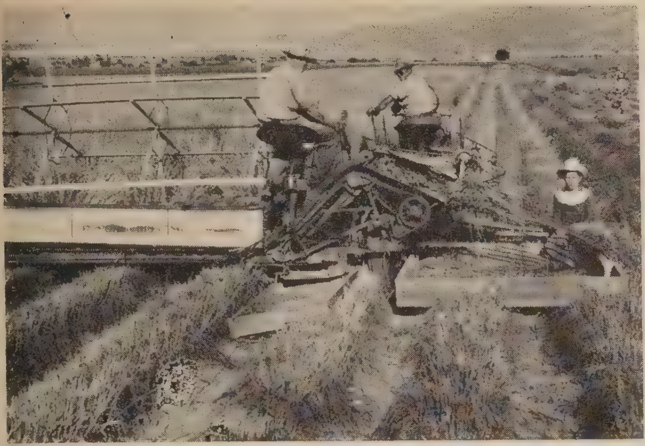
Another crop that has responded to the existing environmental conditions and efficient cultural methods by producing astounding results is the potato. Yields of over 400 sacks per acre are being produced, with many fields of certified seed being developed. The leading variety is white rose. In addition, some Kennebec and new netted gem are grown.

Conservation practices include contour furrow irrigation. By placing the furrows on a contour grade, erosion was reduced and uniform penetration of irrigation water obtained, making possible the more efficient use of water.

A novel means of establishing a seed field was practiced on the Jacobsen Bros. ranch, where small strips of sod were cut from a clean, firmly-grounded planting of Merion bluegrass and transferred to the new site as planting stock. This alleviated much of the weeding problem and produced a medium sized crop of seed the first year.

The harvest is the payoff. As the autumn season approaches, the seed growers keep one eye on the ripening fields of seed, the other being nervously cast skyward for some sign of stormy weather that might cause damage or destruction to the maturing crops.

The same efficiency applied to the production of the crops was made use of in harvesting the product. Man's ingenuity was really brought to bear in harvesting the alfalfa seed. A special windrower was used on the Henning and other ranches, by which the alfalfa was cut and windrowed preparatory to threshing On the Henry Kirschenmann ranch, the next step in the process was being carried out, threshing the windrows of dried alfalfa.



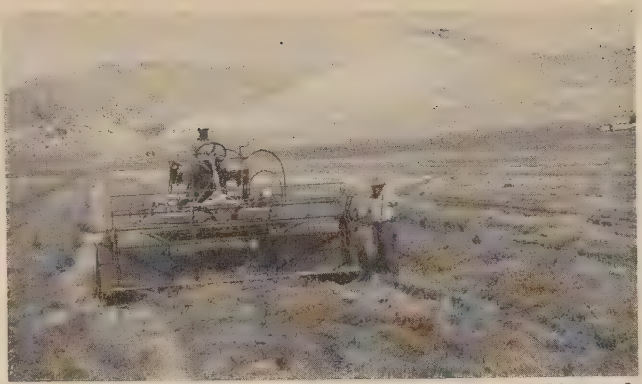
Special adjustments and extra attachments were applied on this standard grain binder to catch the shattered seed of Akaroa orchardgrass.

An interesting innovation was displayed on the Grand Oaks ranch, owned and operated by Don I. Carroll. Here special adjustments and extra attachments were applied to a standard grain binder to catch the shattered seed of Akaroa orchardgrass that would otherwise be lost in the reaping process. The gleanings thus gathered more than paid the bill for harvesting and threshing. After curing in the bundles, the seed was hulled by means of a stationary thresher.

Two methods of threshing were generally employed for Merion bluegrass. On the Grand Oaks ranch, the bundles were placed into shocks to dry, then gathered and threshed by a stationary thresher. The Jacobsen Bros. applied a more novel style. The bundles, immediately after cutting, were moved to a central location and placed on a heavy paper spread on the ground. After sufficient drying, a stationary thresher was brought to the site and the seed extracted, any shattered seed being retrieved from the paper.

Still another style of threshing was used by Ben Sasia on his ranch in Cummings Valley. He used a portable rig to thresh his sugar beet seeds, and harvested the astounding yield of over 6,700 pounds of seed per acre.

The seed story does not end when the crop has been harvested and threshed. Then the process of cleaning the seed to prepare a high quality product for the market begins. To accomplish that task, two seed companies have established plants in Tehachapi. After passing through the cleaning plant, the quality product is ready for market.



Special windrower developed for harvesting alfalfa seed, in use on Henning Ranch.

Bill Patton sacks seed in J. C. Loomis cleaning plant.

By efficient methods. tireless efforts and a never-say-die spirit, the ranchers of the Tehachapi Soil Conservation District have made a brilliant record in developing an outstanding seed-producing enterprise. It is one that adapts itself admirably to the conservation scheme of farming.

"FUTURE" IN PRINT.—The need for a stepped-up program of research, education and cooperation in solving America's natural resources problems is stressed in the final report of the Mid-Century Conference on Resources for the Future. The 432-page book is entitled, "The Nation Looks at Its Resources." Using the actual words of hundreds of participants, the book is an open forum, in printed form, on leading issues in the field of natural resources.

Increased Income Tells the Tale

A recent study on dairy farms points to the monetary advantages of a conservation system over a soil-depleting system.

By R. H. BLOSSER

CONSERVATION farming may increase net income in two ways on many farms. One is by getting a higher return on the present amount of labor and capital used. The other is by providing more hours of work and greater use of capital.

When no additional labor and capital were used, conservation farming gave about $475 more net income per farm per year than soil-depleting farming. But when the farmer used 840 more hours of his own or family labor and $2,500 more capital, conservation farming raised net income about $800 more. Both of these increases add up to $1,275 more net income than soil-depleting farming.

These figures were taken from a recent study made on southeastern Ohio dairy farms. This section of the State is hilly, with many slopes ranging from 10 to 30 percent. On many farms one-half to three-fourths of the original topsoil has been lost because of too frequent farming of whole fields in grain crops. Farms in this study are roughly representative of about 15 million acres of land in southern Indiana, southeastern Ohio, northern Kentucky and northern West Virginia.

Information was collected first on farms having conservation systems of farming. Since these two groups of farms differed in size and production efficiency, it was impossible to compare actual income figures and tell exactly how much conservation farming increased net income. Therefore, net income for both types of farming was calculated for a 120-acre dairy farm using crop production data obtained from the farms surveyed.

In calculating net income everything was kept the same except the amount of conservation practices applied. This method of figuring showed differences in income that could be attributed only to the additional crops produced under conservation farming. Cows producing 9,000 pounds of milk for sale were used for both types of farming. But less grain was allowed per cow under conservation farming. Average prices were used for the period 1943-52 to give a better picture of what might happen over a period of time.

Crop acreages on this farm were the same for conserving and depleting farming. By using contour stripcropping no reduction was needed in the acreage of grain crops for conservation farming. Specific acreages were corn 12, wheat 14, meadow 34, permanent pasture 36, and woods and miscellaneous 24.

The following crop yields were used in calculating the amount of feed produced. For soil-depleting farming yields were 46 bushels per acre for corn, 22 bushels for wheat, and 1.2 tons for hay. Yields for soil-conserving farming were 68 bushels per acre for corn, 26 bushels for wheat, and 2.5 tons for hay. These yields were averages for the soil-depleting and conserving farms contacted in this study.

Soil-depleting farming included red clover and timothy meadows, no contour stripcropping or terracing, small applications of lime and fertilizer on the cropland, and no permanent pasture improvement. Soil-conserving farming included alfalfa-grass meadows, contour stripcropping, and liberal applications of lime and fertilizer on the cropland and permanent pasture.

Soil-depleting farming showed a net income of $2,810. But conservation farming gave $3,285 with the same amount of labor and capitol as used under depleting farming. That's an increase of $475, or 20 cents per hour for all labor used. Most of this additional income resulted from higher corn yields because of contour stripcropping, alfalfa-grass meadows, and heavier applications of fertilizer. With this

Note.—The author is associate professor, Ohio State University, Columbus, Ohio.

limited labor supply, only about two-thirds of the meadow crops under conservation farming could be harvested and fed. The rest had to be plowed under because there was no dependable market for hay.

Conservation farming required 840 more hours of labor and $2,500 more capital than depleting farming when all forage was fed to dairy cows. When this extra labor was supplied by the farmer himself or his family, net income was $4,085. That's a further increase of $800 for the additional labor used. If the farmer hired this additional labor he could still net about $300 more than if he adopted conservation farming and used only the amount of labor needed for soil-depleting farming. He would receive 95 cents per hour for labor that could be hired for 60 cents.

Some farmers might not be able to take advantage of both methods of increasing net income under conservation farming. For example, if a farmer had cows producing 5,000 pounds of milk instead of 9,000, he could not afford to hire labor to use the additional forage produced under conservation farming. Five thousand pound cows would give an hourly return of only 40 cents. But hired labor would cost 60 cents an hour. With low-producing dairy cows, increases in income from conservation farming would result principally from using present labor more efficiently unless the farmer worked harder himself.

Contour stripcropping is one of the conservation practices which help to increase net income.

Old Roads in Vermont

By

WILLIAM BREYFOGLE

"An old road invites to reflection."

This article is taken from a recent issue of *The Land* by permission of Russell Lord, Editor, and the author.

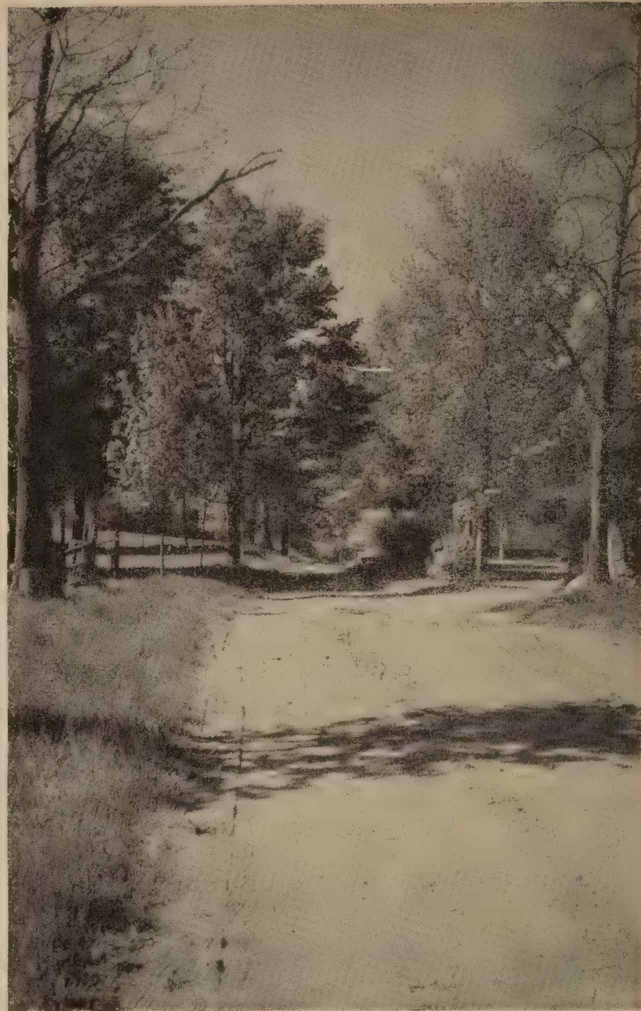
NOT many of the things men make endure longer than roads. For nearly two hundred years the green growth of the Alleghenies has tried to hide the 12-foot track that General Braddock's engineers cut, on their way to death in the wilderness, but there are still places where the old way may be traced. Less famous thoroughfares have just as long a life. The settlements they once served may have disappeared and the houses that were scattered along

them may be nothing but cellar-holes now, but the roads themselves persist.

So far from being only discarded and forgotten relics of the past, they are very busy places, with no suggestion that they mourn their vanished builders and the human traffic that once moved along them. The creatures of the woods resort to an old road for the strip of sunlight it offers. On ledges of rock and on the old walls at the roadside snakes like to bask. By day, partridges use a bare patch of gravel for dusting, and whip-poor-wills come by night. On the road, as on the fields of the deserted farms along it, berry bushes are quick to encroach. Birds come to eat their fruits and rabbits for shelter amid their thorn-set canes. The strong light brings butterflies.

It seems certain that animals with a good deal of traveling to do find the old roads a convenience. Deer must wander extensively in search of pasture, and foxes in search of prey. Here in Vermont, most of the early roads followed the courses of streams, and the easy grades that pleased the first human settlers may recommend them to the deer, as well. They offer easy access to water, too, and because even the most timid animals must drink at times, foxes find good hunting near the streams. So do skunks, moving with the assurance of those who are uniquely endowed.

The historian, no less than the natural historian, may find his account along one of these abandoned roads. It will speak to him of the westward drift of the nation, the opening up to settlement of Ohio and the lands beyond Ohio, which drained away much of the population of the older East. The mood of the men who gave up these holdings was not always defeat, but often hope and adventure. And when they moved, they took a good deal of Vermont with them—the tenacity that could wring a living from thin soil and a hard climate, the wry humor that met adversity halfway and robbed it of much of its sting. Women going to the raw homesteads in the Mississippi basin took with them roots of favorite plants, and yellow roses and red peonies from Vermont bloomed again in Indiana and Illinois—as if an army withdrawing from a hard-fought field had taken with it the flags under which it proposed to fight again elsewehere.



"A good place to keep an appointment with the spring."

The people did not all go at once. On some winter night a fire piled incautiously high burned a house down. Because all the life of the lilacs by the door had drawn back into the deep roots, they grew up again when spring came. But the house was not rebuilt, and there was one house less on that stretch of road. Other farms changed hands two or three times, but grew no more prosperous. A childless old couple died within a few months of each other, and their empty house sagged and sank in upon itself. Grass crept over all but the wheel-tracks in the road, and the neighborhood got a name for being backward and unlucky. Nobody wanted to buy property up that way. One family, setting out for the banks of the Scioto, did not trouble even to close the door behind them. Porcupines moved in and gnawed the woodwork of the empty rooms.

An ecologist would see nothing melancholy

in this supersession of humans by one of the most slow-witted and sluggish of the rodents. It was something predestined, implicit in the nature of the land. Men can and do live in hostile environments, in deserts and high mountains and arctic wastes. But the fortitude and ingenuity thus displayed are admirable only when they are necessary, not when the hard life is deliberately chosen or persisted in. When it became possible to live better in Ohio, the humans acted wisely in turning over their Vermont farm to the porcupines. The gesture of leaving the door open may have been unconscious, but it was none the less appropriate.

There was nothing tragic about the human withdrawal, and nothing flaunting about the advance of the woods to undo the work of men with axes. The transition was effected with no hard feelings on either side. The wild things had no wish to obliterate all traces of those who had once dwelt among them.

The old road is a good place to keep an appointment with the northern spring. The March sun puts high color in the twigs of willows at the foot of a rise and brings bloodroot into bloom beside a stone wall. Crows cry in the new season. A dozen of them will circle and clamor above a fox trying to slip unnoticed through the undergrowth. A little while and female skunks will be gathering rolls of dry grass to line a burrow from which a woodchuck has been dispossessed. There in the darkness the kittens are born, and emerge presently to look for the first time on the advancing sun and awaking earth. The bark that porcupines eat is sweet now with rising sap. Buds swell on lilacs and the gnarled apple trees that have outlasted houses and barns. On a day late in March, even an old road seems to put on youth again, to have a part to play still and good title to its share of the sun.

An old road invites to reflection as a new and busy road never does. That it has been abandoned may seem a proof of the vanity of human effort. But in fact it goes to prove that no check need be final, that beyond Vermont there is always an Ohio. What is immortal about any road is the quality of hope and endeavor that first cut it through the woods. So long as these persist, what happens to the physical road matters very little. At its best, it could never be more than a crude translation of the dream and the purpose that shaped it. All roads worthy of the name lead somewhere beyond meeting, mill and market, and even an abandoned road is one stage on that longer journey.

DEMONSTRATION.—A highlight of the last meeting of the National Association of Soil Conservation Districts was a small-watershed demonstration (see picture) at the Camp Pendleton, Calif., Marine Training Base.

Motor grader, working on diversion terrace, is inspected by the younger set. In foreground are some of the district leaders for whom the demonstration was staged.

A hedge of multiflora rose.

OLD IDEA STILL GOOD.—Proving again that there is "nothing new under the sun," it has come to light that a rose "living fence" was in use even before the U. S. Department of Agriculture was established. This fact has been found in the official report of the Commissioner of Patents on Agriculture for the year 1855.

Paul Bangham, work unit conservationist for the Soil Conservation Service, recently acquired this book and found, under the heading of "Live Fences," an interesting letter from Athens, Ga. It reads, in part:

"The single McCartney rose I found on farms makes an excellent fence. It was planted 4 to 8 feet apart with paling and wire supports, and by layering and trimming the bottom shoots, in 3 years it will repel every intruder."

Now, 100 years later, there are 34½ miles of multiflora rose fence, planted by the Ohio Division of Wildlife, on the farms of 36 cooperators of the Madison Soil Conservation District.

FISHERIES ELECTION.—The American Fisheries Society at its 84th annual meeting elected A. L. Pritchard of Ottawa, director of conservation and development for the Canadian Department of Fisheries, as its new president. He succeeds Fred A. Thompson, fisheries chief of the New Mexico Game and Fish Department.

G. E. Sprecher of the Wisconsin Conservation Department was elevated to first vice-president and C. F. Pautzke, chief of the division of fishery management of the Washington Department of Game, was elected second vice-president.

E. B. Speaker, superintendent of the Department of Biology, Iowa Conservation Commission, Des Moines, was re-elected secretary-treasurer; Howard A. Tanner, Colorado A. & M. College, Fort Collins, continues as librarian.

SWAMPLANDS STRESSED.—The theme of next National Wildlife Week will be "Save America's Wetlands!"

National Wildlife Week has been sponsored annually for 17 years by the Federation and affiliated organizations in the various states. The 1955 dates were March 20-26, encompassing, as usual, the first day of spring.

Although the Federation says the general purpose remains the same—to get more people thinking, talking and doing something about conservation—specific resource objectives have been emphasized in recent years. Last spring the theme was water pollution control. In 1952 and 1953 the nearly extinct Florida key deer and the endangered prairie chicken were singled out for special attention.

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DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

OUR SOIL ★ OUR STRENGTH

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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"PROGRAM OF GREATER SERVICE."—District supervisors of the Savannah Valley (S. C.) Soil Conservation District in the past year provided approximately $100 worth of conservation literature to the libraries of each of the four high schools in the county. Each of the six Garden Clubs in the county participated by contributing to the purchase fund.

NEW ROTATION.—Joe Edwards, of Smithboro, farmer and supervisor of the Marion (S. C.) Soil Conservation District, is trying a new tobacco rotation. He is setting tobacco behind small grain and fescue. The small grain is combined and the fescue turned into the land after a year's growth. By turning under litter and stubble Edwards expects to increase his yields without irrigation.

FRONT COVER.—A band of sheep, well spread out and grazing contentedly, on privately-owned range in Madison County, Mont.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

When the Rains Come

By GEORGE W. MUSGRAVE

I WAS talking to my fortunate friend Joe, who owns and operates a nice farm, when he asked me about that piece I wrote on the different things that happen in soil when it rains. Joe had a good question. He wanted to know how much the water-holding capacity of the soil affected intake. He was concerned about a large amount of talk he had heard about increasing the water-holding capacity. How much can we increase it and what would be the effect?

I had to answer, "Not as much as a lot of folks think. But since this is a bit complicated, let's look at the results of several storms on your farm. Maybe you won't mind if I oversimplify a little."

His farm has nice silt loam, quite uniform originally. But a back forty has been in corn most of the time in recent years and is beginning to show some bad effects. A front forty near the buildings and highway has been in a good rotation and occasionally manured too. It happens that the College and some of our SCS boys have been studying those two fields. Some actual figures about the soil were at hand.

The soil in the back forty that has been "corned" so much, weighs more and has less pore space than that in the front forty. It weighs 78 pounds to the cubic foot while the other weighs 73 pounds. It has 52 percent pore space in it as against 55 percent for the field in rotation. It also has much more of its soil in small crumbs or aggregates. They are about the size of sand grains and give the soil a nice crumbly structure. The figures show 24.7 percent of this soil is in crumbs as against only 10.7 percent in the back forty.

These small aggregates or crumbs have larger pores among them than are found in the field that was "corned" so much. Water enters and moves more readily in such soil, somewhat as it does in a sandy soil.

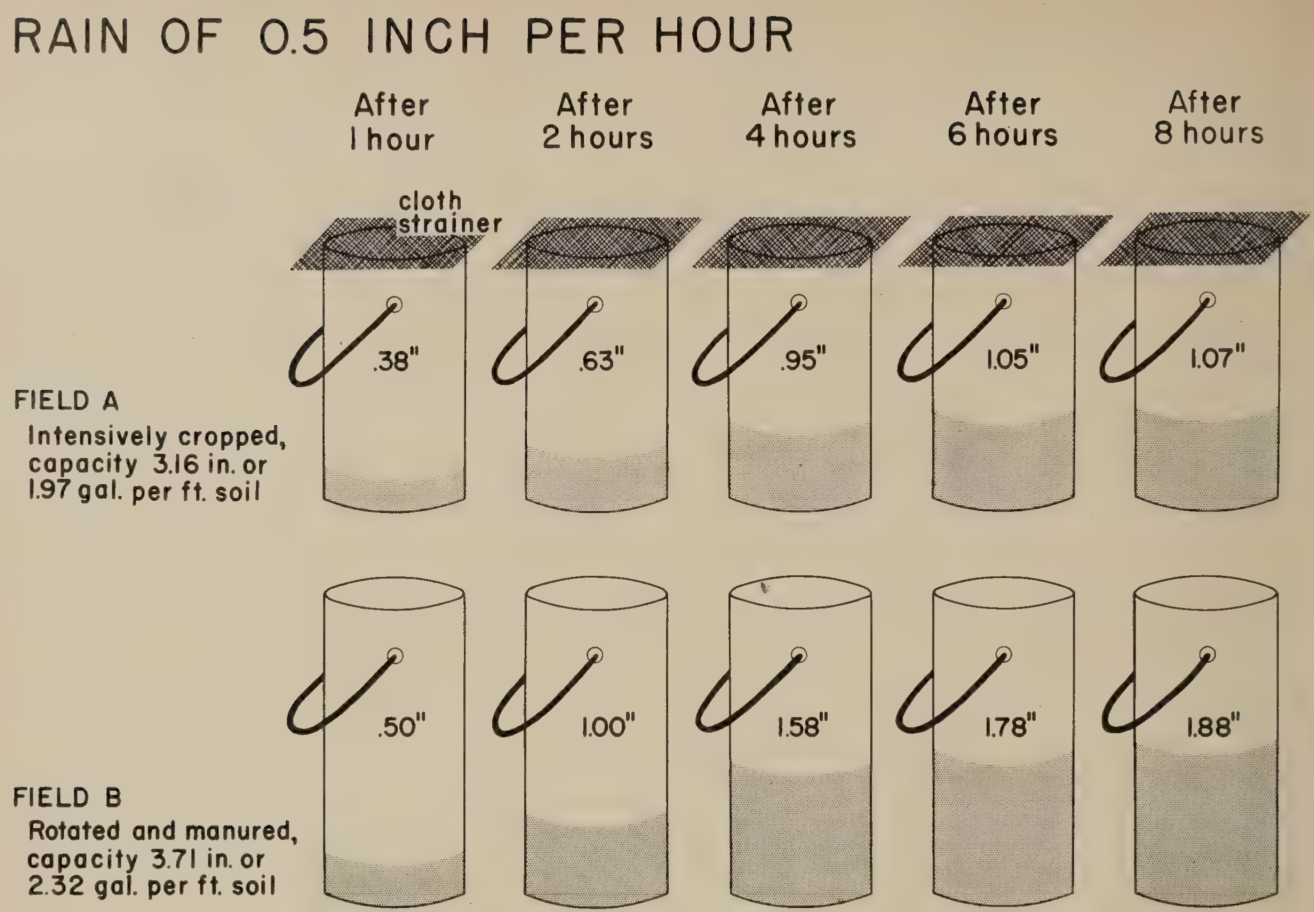
Getting down to Joe's original question about water-holding capacity, this soil does have a little more capacity. It will hold 3.71 inches of rain per foot of depth compared to 3.16 inches for the back forty. The big difference, however, is in the rate of intake, which is much higher where so much more of the soil is in sand-size crumbs.

Let's look at what happens when a storm of common size occurs and when a very large and rare storm comes with little water in the soil. Also, let's see what happens when such a large storm occurs when the soil is already half filled by a prior rain. That should give us a fair picture over a wide range of conditions.

We might imagine that the two fields with different water-holding capacities are somewhat like two milk pails—one holding 3.16 inches (about 2 gallons) and one holding 3.71 inches (about 2 1/3 gallons). The low-capacity one has a slow intake rate, something like a pail with a cloth strainer over it. In the other the intake rate is rapid, as it might be in an open pail. While this is oversimplifying the case, still we can use the actual intake rates and the known capacities of the fields.

The course of the small, common-size storm (4 inches in 8 hours) is diagramed on page 244. During the first hour the intensively cropped field (marked A in the sketch) takes in 0.38 inch and the better-treated field (marked B) takes in 0.50 inch or all the rain that fell. Even though its possible intake rate is 0.92 inch, this is not realized because the rain is less than that amount. At the end of 2 hours the totals are 0.63 inch and 1 inch. During the third hour the rainfall exceeds the declining intake rate on field B as well as on A, and the totals for 4, 6, and 8 hours are those shown on the sketch.

Note.—The author is staff specialist (infiltration), engineering division, Soil Conservation Service, Washington, D. C.



Thus, at the end of the storm the capacity to hold water has not been taxed in either field. Field B is a little more than half full and A about 1/3 full. The remaining water mostly ran off the surface.

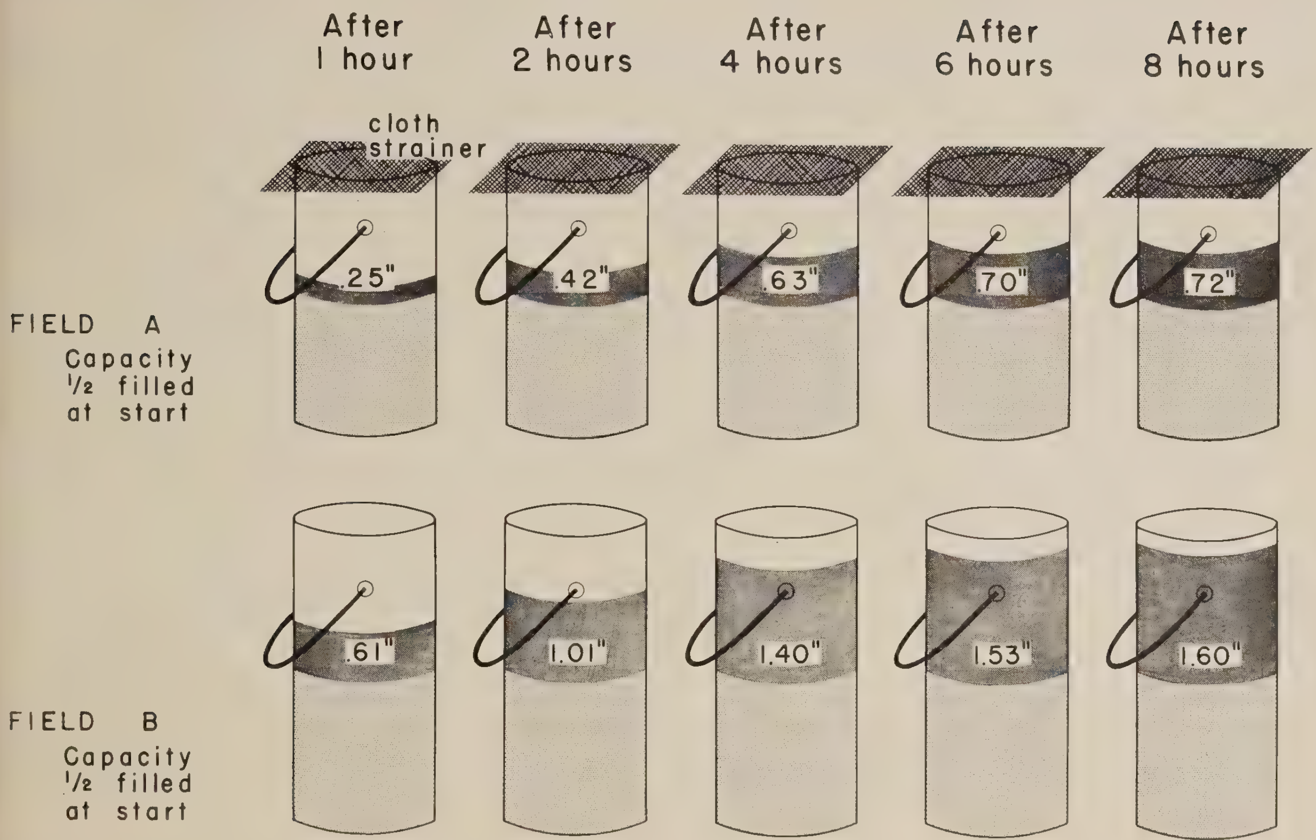
A big, rare storm (8 inches in 8 hours, not shown in the sketch) does somewhat the same thing when it occurs at a time when there is little water in the soil. The same amount of water (1.07 inches) goes into the soil of Field A. In Field B the intake is 2.40 inches—somewhat more than before because the larger rate of rain utilizes the full intake possibilities.

If we now assume the same rain occurs when the soil is already half filled by a prior storm, we give it the supreme test. A rain of this size is very rare indeed in the United States, and then only in a few parts such as the southern Gulf Coast. Because one or more prior storms have wetted and packed down the soil, its intake rate is now less than before, being only two-thirds as high. The effects on these two fields, A and B, are somewhat like that shown in the diagram on page 245 where it is seen that half of the capacity is already filled and the additional intake is added to that amount.

During the first hour Field A takes in 0.25 inch and B, 0.61 inch. The intake on B is higher than that on A, hour by hour, as shown in the figure. At the end of 8 hours, A has taken in 0.72 inch and B, 1.60 inches. This almost fills B but A is only about two-thirds filled. The amount of runoff from A is about 7.28 inches while on B it is 6.40 inches.

It is clear that water-holding capacity, as such, is not the controlling element in this sequence of events. Of first importance are the rates of intake of the two fields. Also important is the rate of rainfall, which in the first storm was less than the possible rate of intake of Field B. The total intake is thus reduced by lack of supply. Even if it should be assumed that the rate of intake was not reduced by the prior storms, then it is *Field B* and not A that has its capacity taxed. It is B with its higher intake rate and larger ca-

RAIN OF 1.0 INCH PER HOUR



pacity that first fills. It is the surface condition that is the primary control of amount of water added, in this case.

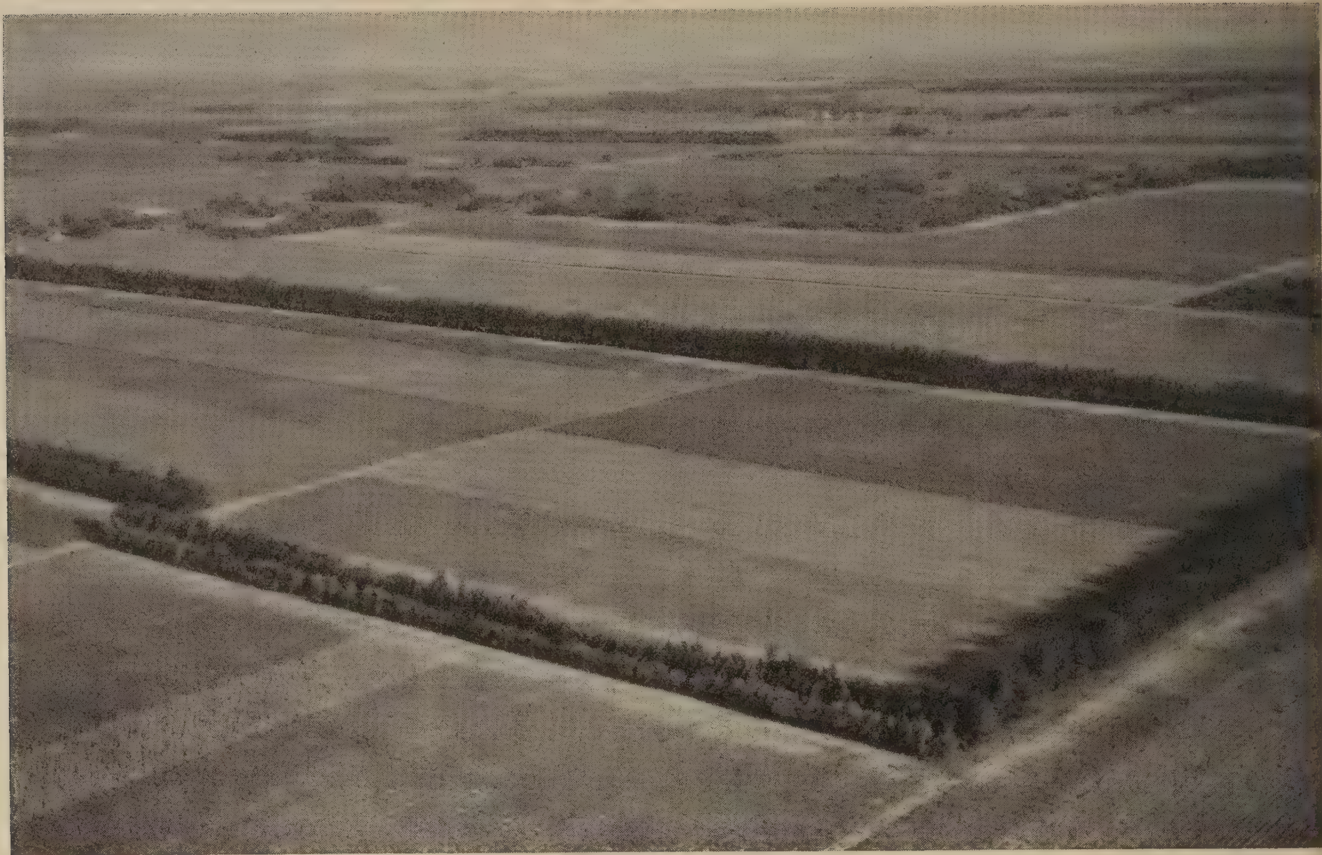
Therefore, the answer to Joe's question (which I think he had already sensed) is that whether for crop production, flood control, or watershed management, the intake rate is all-important.

Fortunately intake rate is one of the things that can be greatly changed, whereas water-holding capacity cannot be greatly changed, at least on a field-scale basis. Growing grass or trees, protecting soil against excess loss of organic matter or where needed, adding organic matter, nearly always improve rates of intake. To increase water-holding capacity in a sandy soil would require the addition of a lot of clay. Adding organic matter has a relatively small effect on capacity. Dr. Peele of the South Carolina Experiment Station, who has studied this thoroughly, has reported that on sandy loam soils each additional percent of organic matter added less than one percent in available water-holding capacity.

In watershed management the treatment of land is not aimed at increasing its water-holding capacity.

Rate of intake, however, often is greatly improved, and thus the rate of movement of the water through the soil to the outlet of a watershed is delayed over that moving on the surface. Surface movement of runoff also may be retarded by land treatment as well as by structures. The overall effect of the things we do to watersheds is temporarily to retard outflow from it. This may seem to some to be an increase in water-holding capacity. The two, however, are not the same. The dense vegetation of forests, grass, crop rotations, and so on promotes intake and retards overland flow of water without necessarily making any great change in capacity of the soil.

Joe did have a good question and one not easy to clear up. He thought that maybe there was too much talk about increasing water-holding capacity of soil. And another thing he said—he was going to change that corn-corn-corn cropping on the back forty!



Enclosed field on T. J. McGill farm southwest of Vernon, Tex.

Which Way Blows the Wind?

This study relates Weather Bureau data to the compass. It should be useful in deciding how to place such conservation practices as stripcropping, shelterbelts and contour tillage to combat the damage from violent air movements.

By C. D. BREHM

WIND erosion of soil may result from a single cause, or from a combination of many factors. It is equally true that the control of wind erosion may be effected by a single practice, or under other conditions require multiple practices and combinations. Thus, are posed many interesting questions.

When we have a full understanding of particle sizes, soil erodibility, surface condition, vegetative cover, and wind velocities—do we have all the answers? Generally, yes. Would a knowledge of damaging wind directions be helpful? Are data on prevailing wind directions satisfactory information for predictions as to the direction from which damaging winds will appear? For the last two answers, it appears that we need more data to go on than is now at hand. Wind directions also are important when wind strips or shelterbelts are used as a control measure.

Wind erosion on cropland is minimized when crop strips, alternate close-growing crops and

Note.—The writer is conservation engineer, Soil Conservation Service, Huron, S. Dak.

row crops or fallow, or shelterbelts are placed at right angles to the direction of windstorms. Planning for the conservation practices of wind stripcropping, contour stripcropping and field shelterbelts, therefore, necessitates a recognition of wind velocities and directions that may cause soil losses.

Crop strips and shelterbelts are usually laid out across the prevailing winds. Actually, there are varying opinions on the best direction for wind stripcropping, even though the prevailing wind directions are known. The pattern of wind stripping varies considerably wherever it is used. Although some crop strips are farmed the long way of the field to reduce machinery turns, many farmers, on the basis of their experiences with heavy windstorms, choose directions calculated to protect their land.

The varying velocities of a windstorm have a somewhat proportional effect on the amount of soil erosion. Smaller particles of soil start moving at velocities approaching 15 miles per hour. As the velocity increases, the erosion also becomes greater. A dry soil lacking proper crop residues and surface roughness will seriously erode when the wind velocities exceed 15 miles per hour and continue for several hours. Since these conditions are common, effective planning of control measures should be based on a full knowledge of all available information. Research indicates that the orientation of wind strips and shelterbelts is a minor consideration, but it still is important. Certainly, a hodgepodge of data on prevailing wind directions and velocities which is a mere compilation of all winds—large and small—is not likely to help. Almost everyone will agree that winds of 15 miles or less, occurring over a period of many days, threaten very little erosion.

There may be some persons who feel that windstorms are most destructive during spring and less damaging during summer and winter. It is recognized that the soil surface usually is protected by plant cover during the summer months, and, in some localities, by snow or ice during the winter. Unfortunately, such coverings cannot be relied upon to protect the soil at all times.

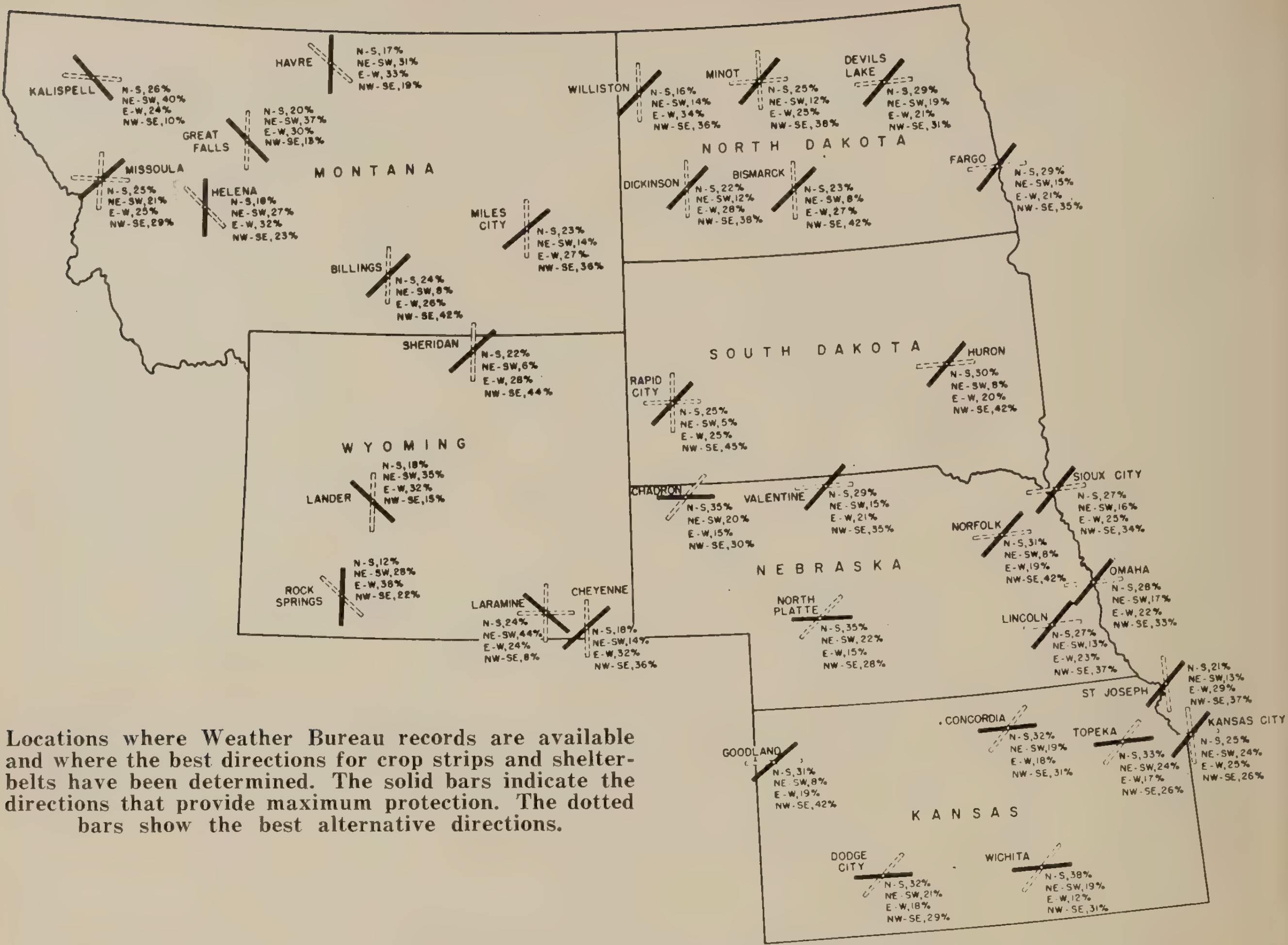
In view of the need for protecting land and crops from damaging winds, a study was made of weather records to see if it was possible to develop useful criteria for the installation of wind protection practices. The primary concern was in getting a guide to the orientation of such practices as shelterbelts, stripcrops, and contour cultivation.

In this study it was assumed that the highest velocity windstorms each month are the most destructive ones. Reports by the U. S. Weather Bureau supply this information wherever there is suitable equipment for recording it. A study of wind conditions would require data comparable to that on rainstorms. Rainstorm data is complete in that the intensity, in inches per hour, is given along with the duration. More data on windstorm velocities, direction and duration would provide the information that is needed by our agricultural technicians. With data limited, however, we had to rely on the single maximum storms at various stations throughout the Northern Great Plains States.

The map I include shows the Northern Great Plains area and summaries of information obtained from various Weather Bureau stations. The percentage of storms in the various quadrants of the compass are shown, as well as bars representing the best direction for wind stripcropping and shelterbelts on flat lands at various stations. If some other direction is desired by the land operator, a comparison of windstorm percentages can be made to determine the best alternative direction. In most cases, the alternative direction does not provide as much protection as the first choice.

This map shows that the direction of high velocity winds varies considerably throughout the region. There may be contrasting variations at stations relatively close together, such as shown for Cheyenne and Laramie, Wyo. Here, the proximity of high mountains probably exerts a marked influence. Elsewhere, local topography of other kinds may have some influence on wind direction. It is for this reason that local weather information should be used to the fullest extent possible in planning wind-erosion control practices.

Where water erosion hazards also are present on sloping land, consideration should be given to contour stripcropping and other appropriate practices to help control both wind and water erosion. Any stripcropping on the contour is usually irregular in its directional



Locations where Weather Bureau records are available and where the best directions for crop strips and shelterbelts have been determined. The solid bars indicate the directions that provide maximum protection. The dotted bars show the best alternative directions.

pattern, so that only a portion of the field may be exposed to the full effects of a destructive windstorm. If a portion of a contour stripped or terraced field lies in the most hazardous wind direction, changes in land use or types of growing crops should be considered on those areas susceptible to wind erosion. Grassed turnrows along roads or field boundaries assist in decreasing wind erosion at the field edges.

Where the most damaging windstorms occur from all points of the compass, perhaps more consideration should be given to narrower width strips than where the wind flow directions are more definite. Additional emphasis then will need be given to stubble mulching or residue cover as a supplemental measure.

The U. S. Forest Service has conducted studies on the directions and mile-hours of all winds in the shelterbelt areas of the Northern Great Plains. From these studies, determinations were made as to shelterbelt orientation which would provide the greatest protection. The high velocity windstorm data presented in this paper show orientation comparable to that obtained by the U. S. Forest Service.

This study of monthly maximum windstorms (wind velocities of 15 miles or more and durations of 2 hours or more) and their directions of flow indicates a need for additional detailed data. It can be seen that further consideration of high velocity windstorms should be given in both the planning and application of conservation practices. Mile-hour and directional data on all high velocity windstorms ultimately may be the best method for determining directional control of soil erosion by wind.

NATIONAL WILDLIFE OFFICERS.—New president of the National Wildlife Federation, elected to his sixth consecutive term, is Claude D. Kelley, of Alabama. Vice presidents are Paul A. Herbert, Robert Miller, and John L. Curran. Directors are William M. Apple, Ira L. Porter, Louis D. McGregor, Howard Stone, and A. E. Riegel. Secretary is Charles H. Callison; treasurer, Louis W. Wendt.

Soil and Water Conservation in Action

By D. A. WILLIAMS

IN our soil conservation program's early phases, emphasis was on keeping soil from moving away. Without by any means neglecting the continuing problem of water and wind *erosion,* we moved to give more attention to sustaining and building *soil fertility.* Still more recently, renewed emphasis has been placed on *water management.* Now, all of these components of modern soil and water conservation as we know and practice it today *hinge on land use.*

Water management, to illustrate, requires that we use measures to take care of the structure of the soil; otherwise, it won't take in the water needed. Very shallow soils, for example, won't hold enough moisture for growing corn, let us say, even if we put on fertilizer, and even if we can irrigate. Many of you have had experience with these difficulties during the recent dry years. And, at the other extreme, certain soils present serious problems of drainage, again calling for intelligent conservation water management to assure their productivity.

I mention this by way of emphasizing something of the complexity of the soil and water conservation job in which you and I are engaged. It isn't one that can be taken care of with a once-over-lightly technique of planning and land treatment, just for the sake of expediency in answering that repeated appeal: "When are you boys going to get out to my place?"

Conservation, in other words, is not "just good farming." All the "good farming" we did before we launched the sound conservation program which we know today in this country did not keep us from damaging and depleting our soils to a dangerous degree. So, as I have said many times before, I don't think we ever again can use the label of "good farming" accurately until it represents the kind of operation that has been reached only after the development and application of a basic conservation farming plan, based on appropriate research and experience and detailed soil surveys.

It comes down to putting first things first. It means laying foundation practices soundly, such as, to mention one, taking care of a fundamental problem of water utilization or water disposal on which to base conservation rotations and other needed practices. It means striking a balance between vegetative and engineering practices, for instance—so we can say, "These are the things that are important" and "Here's about the way we are going to get at them."

Through what thus amounts to a broad-scale program analysis, developed together by the technicians and the soil conservation district supervisors and all the others with whom we work, we can be certain of whittling off a good chunk of the job each year and keep moving toward our main objective of a coordinated soil and water conservation program.

I think the wisdom and effectiveness of this first-things-first approach that has been perfected and refined in the last quarter of a century through soil conservation districts, the Soil Conservation Service and the Department of Agriculture speak for themselves.

I think we all recognize the need for complete and adequate information about soils before going ahead and building the framework of sound vegetative, and structural, practices. So we want to make more effective *use* of our soil survey information. Right now, for example, we are paying particular attention to soil-site correlation in timber and rangeland areas. We need to get over the idea that any old land is good for growing trees, just because it is in Arkansas, let us say, or is good for growing grass because it's in Wyoming. We want to be able to say with certainty which soils are ca-

Note.—Mr. Williams is Administrator of the U. S. Soil Conservation Service, Washington, D. C. This article is adapted from an address delivered at the annual meeting of the Arkansas Association of Soil Conservation Districts in April.

pable of economic timber or grassland production, which is what these soil-site correlation studies are aimed to demonstrate.

We also are getting together some more comprehensive information on the urban and other non-farm use of agricultural land. We want to find out what the trend is with respect to demands upon our definitely limited acreage, nationwide, of good agricultural land, and whether it is good land, poor land or what that is going into suburban developments, factory sites and so on.

All of this sort of information can be most useful in our conservation planning ahead, and all kinds of groups look to us to have such information. You in your soil conservation districts, for example, may anticipate being called upon to contribute your knowledge and experience to such broader problems of land use, even after your immediate goals of basic conservation planning and treatment of your districts' farmland proper have been realized.

Another question is to what extent we should move away from the historical base in our agricultural programs in favor of a land class and capability base. That is something else that will take time to answer. Here, again, we run into the matter of coordination of programs, with an important part played by the soil survey, which will have to be finished, essentially, on a uniform basis.

Let me assure you that I am not for a moment suggesting that we get ahead of ourselves and forget that *immediate* job which we are about. That is, the carrying out of *good, sound soil and water conservation programs* on farms and watersheds, *based on sound basic planning.* We still are losing vast quantities of productive topsoil through water erosion. New gullies continue to riddle too many of our sloping fields each year. The "dust bowl" threat has not yet been erased from the Great Plains, where about 7 million acres of land were damaged by wind erosion in seven states from last November to March 15.

We have, as you know, moved to speed up conservation farm planning by means of progressive planning in the last few years. In other words, recognizing that *tools should not be objectives,* we have made more flexible the progressive development of, and placed more emphasis upon, *sound conservation plans as basic to conservation accomplishment.* Progessive planning, which I feel has accomplished what was intended wherever it has been given practical application, never was meant to be an end in itself, but it is a good way of reaching the goal of more basic plans sooner.

A conservation farm plan is basic, of course, if it does the things that are essential, such as providing for stopping erosion, improving soil fertility and productiveness, and providing for management and best use of farm water.

Adoption of a conservation plan is, of course, a matter of the farmer's decision. One of the first things he naturally wants to know is whether conservation will pay him.

We realize that it is not our job, in the Soil Conservation Service, to undertake comprehensive economic analyses or anything of that sort. But, in taking into account all the elements that go into a basic conservation plan, I think we do share the obligation of showing how conservation benefits will exceed the cost within a reasonable time. It is all part of the essential approach to a coordinated conservation program, farm by farm, watershed by watershed, district by district. That is what you are concerned with as district supervisors and cooperators. It is what we are concerned with as technical conservationists assigned to assist you in your programs.

The principle of a completely coordinated program is not new, and it still is basic. Effective conservation—using the land within its capabilities and treating it according to its needs—cannot be just a soil-engineering operation, for example. In dealing with land-use and water-management problems under varying local conditions, either structural or vegetative measures may be the principal remedy, but generally we find that a close combination of the two types of conservation technology is required.

The Service has been giving increased attention to coordination among the different technical phases involved in our operations, realizing again that we can't do a fully effective job of engineering work or water management, let us say, without understanding soils and plants, and tying the various phases together in working with local people. We now have

people in the States who are responsible for all these elements of technical assistance—in soils, engineering and plant technology. Their business is to understand and give competent help on such respective local problems as, for example, cropland, woodland and water management problems.

The watershed program is not something to take the place of your regular soil conservation districts programs. To the contrary, just about everything you are doing in your districts will be all to the good as you move into watershed programs. This is true of your reforestation and woodland management, pasture improvement and development, crop rotations and cover cropping, contouring, terracing, farm ponds, and so on through the list of familiar practices.

In other words, land treatment goes with or, actually, precedes other watershed protection measures. The more sound and efficient the land use program is on any watershed from the outset, the better. It is the backbone of watershed conservation, as it is of your soil conservation districts' programs.

The policy of the Secretary of Agriculture for administration of the watershed act was announced in mid-March. It marks an important step looking toward pushing ahead with this undertaking in which there is such widespread interest. Local watershed organizations already have asked the Department of Agriculture for help in developing work plans on about 300 small watersheds over the country, and an estimated three times that many altogether are in some stage of consideration in the states.

Secretary Benson's policy statement points out that the initiative for all projects must come from the people in the localities involved, and calls for the development of maximum initiative and responsibility by local organizations.

The watershed program is truly one of the people affected—not a "federal government" program. The local people accordingly must have a real feeling of need for it and be ready and willing to meet the cost-sharing, operation and maintenance and other stated requirements for federal assistance.

I won't attempt to discuss all the policy or other details, which are available to you locally. We all are going to have to become familiar with the details together. I know it is a little hard to shift our thinking, for watershed development purposes, to a project-type approach with the cost-sharing and other details with which some of us may not have had too much experience. But I am sure, from our experience so far in this and the pilot watershed protection projects program, that we may look forward to successful watershed accomplishments through the local-state-federal teamwork that goes into it.

The watershed protection program, like your districts programs, provides a means for truly coordinated teamwork through group action in multiplying our efforts for soil, water, timber and wildlife resource conservation and development.

It is entirely possible that there still are resources in time, labor, equipment and materials that the districts haven't yet drawn upon to the extent they could in furthering your programs of greater service. These may be available from state or other public agencies or from private sources.

Conservation credit, for example, is one important tool for helping to get the job done that certainly should not be overlooked. More such credit facilities are available today from public and private sources than ever before. The 1954 Congress, for example, amended the Water Facilities Act to provide for both direct and insured loans for certain soil and water conserving practices, through the Farmers Home Administration and private banks, in all states. This financial resource for conservation advancement may be drawn upon by both individuals and groups.

Congress also, in 1953, amended the Federal Reserve Act to permit national banks to accept properly managed growing timber as collateral for real estate loans, under certain conditions. And, of course, I am sure that by this time many of you have already become familiar with the new provision in the revised internal revenue law, enabling farmers to treat expenditures for a number of soil and water conservation measures as current expenses that may be deducted, at prescribed rates from farm income for tax purposes.

I feel we can all move forward with renewed enthusiasm to the task that lies ahead.

A Look at Old Lands and New Problems

By EDWARD H. GRAHAM

Terraces at Ravello, Italy, support 3-storied agriculture with trellised grapes above vegetables, fruit trees above the grapes.

Wellington Brink asked me if I would jot down some impressions of our Guggenheim trip for this issue of the magazine. "I know you are going to do some heavy stuff about it one of these days, but I think the folks in the Service would like to know just where you went and something of your impressions while you were away," he said. So herewith a try at filling his request.

FOR some years it had been my good fortune to get around in the Americas. While with the Carnegie Museum at Pittsburgh, Pa., I came to know much of the vegetation of the United States—its forests, grasslands, and desert. In British Guiana I had an opportunity to study tropical American rain forest. With the Soil Conservation Service I learned the effects of use upon soil, plants, and environment throughout the States. I got into Mexico and Central America and traveled the tortuous roads of the Venezuelan Andes with national technicians who were trying valiantly to control erosion in this populous mountain region.

All of this was "new" land, intensively used a relatively short time as human history goes. I became anxious to see some part of the world that had been under heavy human impact for millenia, not centuries. What did soils look like that had been cultivated for thousands of years? In what shape were the slopes, now bare, where the branches of forest trees once touched? Did the herds of antiquity reduce the condition of nomadic ranges beyond the point of recovery? These and many other questions I wanted to try to answer for myself.

The opportunity came with the award of a John Simon Guggenheim Memorial Foundation Fellowship in 1954 for "a comparative study of the use of land resources of certain countries of the new and old worlds." I am deeply indebted to the Foundation for the grant, and to the Service for leave during a critical period of our development. With such help and encouragement Mary and I were on a trans-Atlantic plane bound for Lisbon April 18, a year ago.

Although it is difficult not to cite them as we recall their invaluable help, it is necessary in this brief account to forego naming the many persons—all the Americans abroad and those whose homes were the countries we visited—who made our trip pleasant and profitable. We hope to acknowledge individually at another time the help they gave us, for we shall long remember them.

There was only a short stop at Lisbon, but we got out of the city to see maritime pines dripping resin into ceramic cups for naval stores, and great groves of cork oaks for which the Iberian peninsula is famous. The olive—dendritic emblem of the Mediterranean world—was a common sight, often with wheat as ground cover beneath the trees. This with the characteristic Mediterranean maqui chaparral of shrub oak, Juniper, Ulex, and madrono, told us that we had—overnight, as in a dream—moved out of the New Hemisphere into the world's longest inhabitated region.

A short stop in Madrid allowed, among other things, a visit to the new University City, rising on the battleground of the Spanish Civil War. Here there is a magnificent new Forestry Institute, its architecture modified Egyptian. The Institute houses a modern hydraulics laboratory, the only experimental pulp paper mill in the Mediterranean, with machinery newly installed from Sweden, international experiments in torrent control and many other facilities for learning more about and teaching forestry in its broadest aspects. We were soon on our way, however, to our first major stop—Algiers.

In Algeria we were to make a north-south transect from the Mediterranean coast, up and over the northern range of the Tell Atlas, across the Hautes Plateau, over the Sahara Atlas, and south into the northern edge of the Sahara itself. In the north Atlas range we saw rugged mountains, the higher slopes still clothed in holly oak and Atlantic cedar. Below altitudes of 3,000 to 4,000 feet, long attempts at cultivation have caused serious erosion. The French Government, through its soil conservation technicians, is providing help in a dramatic program of terrace construction and revegetation in this steep terrain. The "banquettes" are a noble effort to rehabilitate abused land. This work, less than 10 years old, plus some

Note.—The author is director, plant technology division, Soil Conservation Service, Washington, D. C.

Part of the family add weight to the threshing sled behind a team of water buffalo in the Nile delta of Egypt.

good looking reforestation begun as early as 1910, shows an acute awareness of the need to attend to the land problems in this mountainous area. At lower elevations, where the hills slope northward to the sea, vineyards were being set on the contour—harbingers of the shape of things to come in North Africa, as contour farming is here at home. And as at home, there is the problem of floods from denuded watersheds. We arrived after a heavy spring rain—probably 100-year frequency, we were told. The washed-out roads, damaged bridges, toppled telephone poles, and erosional debris that filled the streams were little different from what many of us in the Soil Conservation Service have seen in the States.

What we saw in the Tell Atlas somehow struck me as closely related to what we had seen in the Venezuelan Andes 2 years before, perhaps because of the deeply dissected terrain and the fact that in both regions the mountains were densely populated. In the Andes "conuco" farmers practice the shifting cultivation of the tropics; in the Atlas the Moslems follow temperate zone agriculture. In the former case there was year-round growing weather, varied only by dry and wet seasons; in the latter, winter temperatures drop to 30 degrees below zero, with 6 feet of snow. Yet, in both instances increasing populations on the steep slopes cause very difficult land use problems and call for very costly remedies. They illustrate well the problem of mountain lands.

Our travel was largely by plane, at least between major points, because flying and prearrangement with those with whom we wished to work almost doubled the time at our disposal. But we went by bus from Algiers across the mountains to Biskra, then by narrow gauge railroad south to Touggourt. South of the mountains we saw our first Bedouin encampments with camels grazing on the open range that looked like the shadscale desert of Nevada. One of the ancient caravan oases on the north-south African route, Touggourt is now a sizable town, buff colored with adobe and dust.

Southwest of Algiers an extensive construction of "banquettes" checks erosion in the Tell Atlas mountains.

The heavy load of erosional debris carried from the Atlas Range indicates the need for watershed conservation.

The slender minaret of the mosque told us this was Moslem country. A camel trip took us into the knife-edged dunes of the Great Eastern Erg, where we walked in the soft loose sand that composes it. And at Touggourt we saw oasis agriculture at its best. Thousands upon thousands of date palms were neatly spaced in rows with ditches carrying water pumped from artesian strata far below to supplement the original oasis spring. Between the palms there was grain, or vegetables and flowers, or grass for grazing sheep.

Returning northward we retraced our route by train to Biskra, then swung northeast with a stop at Batna, from where we could visit the ruins of the Roman town of Timgad. Once a thriving city of 12,000 or more inhabitants, Timgad vividly reminded us of the vigor of Rome twenty centuries ago and the broad extent of her influence. Wherever we went, from Spain to Syria, from North Africa to England, we were never far from tangible evidence of the great Roman Empire. Even in England today the only straight roads, which cross the country from one end to the other, are resurfaced Roman highways! Roman utilization of water for both domestic and agricultural purposes is worth a thorough study of its own.

On by train through Constantine we reached Tunis, whence we recrossed the Mediterranean

Irrigated date palms exemplify modern oasis agriculture near Touggourt, Algeria, on the north edge of the Sahara.

by plane to Rome. In the large modern building which serves as world headquarters for the Food and Agriculture Organization of the United Nations, I talked with many of the agricultural leaders in this highly respected agency. A trip south of Rome disclosed the flat, productive fields that once were the Pontine marshes—drained by Italian engineers in Mussolini's day. And near Salerno, on the steep

calcareous slopes above the Mediterranean, we saw the most intensive cultivation of the trip. Supported by rock terraces, the result of untold human effort, were small flats of man-made soil. Vegetables on the ground, grapes trellised overhead, with fruit trees protruding above the grapes, this three-tiered agriculture is a marvel of hard toil and patience. Class VIII land is here transformed to Class I. No mechanical agriculture could possibly support so many people per unit of land.

Another flight and we were in Athens. Greece is a splendid example of technical teamwork between its own forces and those of the United States. In all aspects of land and water use—cropland agriculture, range conservation, forestry, water management—solid planning and application have increased production from a base of 100 for the years 1935-38 to 166 in 1954.

Twenty four hundred years ago Pericles built the Parthenon. For longer than that the hills of Greece have been lumbered and grazed. In the high mountains, as on Mt. Olympus, there are still forests of pine, oak, and chestnut, but the trees have long since disappeared from all but the most remote sections. We traveled by auto from Athens through the plains of Thessaly and Macedonia to Salonika and farther north to within a few miles of the Bulgarian frontier. We saw severe erosion and debris-choked streams. But we also saw reforestation, improved range management, large drainage and irrigation schemes in the valleys, crop rotations, contour cultivation and torrent control. And on the age-old alkaline river flats near Thermopylae, recently reclaimed soil had helped to change Greece from a rice-importing to a rice-exporting country in 5 years' time. The course is scarcely charted, and there is a long way to go, but more than a fair start has been made by the courageous Greeks.

In Egypt it was a thrilling experience to walk the soil of the Nile Delta and to recall that this very place has been in continuous cultivation for 6,000 years or more. All about was intense activity—almost all hand labor. Water is still raised from the canals to the fields by hand-turned Archimedean screws; the soil is turned by the wooden Egyptian plow; wheat is harvested by water buffaloes slowly circling a sled disk over the cut stalks. In this area of 6 million acres there live 2,500,000 cattle and 20 million people. And the people increase. There are plans to raise the Aswan dam, thus bringing 2 million acres of higher land into cultivation. It is of interest that yields of the major crops—wheat, cotton, Egyptian clover—are higher than U. S. averages. The Egyptians excel in per acre yields while we, of course, exceed them in production per man.

A hundred miles west of Alexandria we put up in one of former King Farouk's rest houses, now field headquarters for the Desert Institute, organized under the powerful Egyptian Production Council. Here is the site of a magnificent attempt to improve Egypt's desert range. Grazed by herds of Arab nomads for no one knows how long, the depleted vegetation of this semiarid land presents a major problem to the range conservationist. With some assistance from U. S. technicians, the Egyptians have established a 2,500-acre enclosure to study the effects of protection from grazing, water spreading, reseeding, and pump irrigation of small areas for supplemental feed. The Arab sheiks are working with the Institute and closely watching the results. The work was in its first year, so it is yet too soon to tell what will come of it. From our own improvements in range condition, however, it is reasonable to expect the Egyptian experiments to prove fruitful and all the more exciting if this ancient range can be at all improved.

We flew from Cairo to Beirut, Lebanon, a favorite city of Americans in the Near East, and the home of American University, one of the leading centers of higher learning for Moslem scholars. Here I took part in a UNESCO conservation conference and met representatives from eight countries of the Middle East. There is an awakening interest in natural resource management throughout this region. Lebanon itself presents a story of land use since the earliest period of human history. A sacred grove of Cedars of Lebanon, preserved within a masonry wall, while all around are stony, eroded slopes, is in itself a solemn lesson in what man can do to his environment. The terraces, ancient and modern, that are so characteristic of this antique land, are in themselves of great interest.

For many centuries the terraced hills of Lebanon have yielded fruit, grain, and other crops.

It is but a short drive eastward from Beirut to Damascus. One crosses the Liban Range, with its terraced grain, vegetables, and fruit, the broad Bekka—a fertile rift valley at 3,000 feet—and then the Anti-Liban Range, to drop into the arid plains of Syria. Damascus is one of the world's oldest continuously inhabited places, and perhaps its largest oasis. Here a full-fledged river rises from the hills to water an area 5 to 10 miles wide and 40 miles long. All around this area is the desert, with a rainfall of not more than 8 inches per year. But where the water flows are crops, pastures, and fruit—even irrigated woodlots producing willow and cottonwood for fuel, construction, and furniture. Throughout Syria FAO technicians are helping to work out solutions to various land use problems, and we saw their work in the irrigated section and the desert as well.

Our next stop was Turkey. Here modernized Islam presented strong contrast to the other Moslem countries we had seen. Arriving by air at Istanbul, we found an Arabian Nights' city dominated by huge and splendid mosques, and what must be the world's most phrenetic harbor. Thence, by train we traveled to the new capital of Ankara in the rolling Anatolian Plain. At Ankara I took part in an FAO-University of Ankara conference on range, pasture, and forage development, which brought leading Middle East technicians together for a workshop on improved plant technology in the Mediterranean. After the conference we got into the field to see something of Turkish agriculture and native range. One-half of Turkey is grazing land, and the home of many of the world's most widely used forage crops, such as alfalfa, burclover, sweetclover, and many of the common trifoliums. A great deal has been made of the mechanization of Turkish agriculture. We saw some evidence in the extensive wheatlands of the plateau that the rapid changeover to use of heavy farm equipment was increasing the

erosion hazard, and some of the agricultural technicians in Turkey are concerned about the matter. There are invariably problems arising from the impact of western technology upon countries and peoples who are suddenly subjected to it.

Back at Istanbul we again took to the air for Rome, thus completing our circle of the Mediterranean. In Rome we further discussed with FAO officials what we had seen and what it meant. From here our plan called for travel by car northward through western Europe. We crossed the Apennines and dropped into the great Po Valley, Italy's prime farm area. The agriculture of this broad productive alluvial plain is in strong contrast to the abused mountainous part of the country south of Rome. Thence, into southern France and up the Rhone valley to Paris, where we attended the VIIIth International Botanical Congress.

After the Congress we drove to Switzerland, to spend several days with the foresters of the Swiss Technical Institute. I had long wanted to see the managed forests that represent some of the world's most progressive thinking in forest management. The Swiss combine a detailed knowledge of plant ecology with hardheaded practical realism in forestry, and I learned firsthand something about "femelschlag" and "plenterwald" methods. The trees themselves were a delight. Silver fir and Norway spruce better than 3 feet DBH reach 120 feet straight toward the sky. Swiss forestry is a good example of what we have to learn from others.

In the area below Damascus wood, as well as forage and cultivated crops, is produced from irrigated fields.

The ruins of Timgad in northwest Algeria illustrate extensive Roman occupancy of north Africa before the fall of the Empire.

Our route took us to Innsbruck, Munich, and down the Rhine valley into the Netherlands, where we wanted to get a look at the justly famous reclamation work that has literally made the country. At Wageningen—the Netherlands' Beltsville—we were graciously received and were accompanied on a circuit of Holland, which permitted us to see firsthand its woodlands, heather, unbelievably productive pastures, cultivated fields and bulb land. "This is a millimeter country," we were told by the Dutch, and their delicate manipulation of water, intimate knowledge of soil-plant relationships, and scientific approach to all land and water problems is ample proof of the contention. Back of it all, starting in the 13th century, their fight against the North Sea is culminating in the enclosure and drainage of the Zuyder Zee, still in progress. Almost half the country would be flooded by sea water if it were not for the coastal dunes and dikes. I can imagine no more productive example of human ingenuity and perseverance than the things the Dutch have done with their land.

From Holland we drove to Brussels—where we learned more about European vegetation surveys—and to Ostend, where we took the ferry to Dover, thence on to London. Here it was possible to learn something of the agri-

cultural and land use programs of Her Majesty's government, and to meet many of her public servants. From London we were within striking distance of Rothamsted, the world's oldest agricultural research station, as well as Cambridge and Oxford Universities, all of which we visited. At the latter I was a guest of the Bureau of Animal Population, whose work has long been familiar to American ecologists. We also got into the rolling farmlands of the Salisbury Plain west of London, and the reclaimed fenland to the north of the metropolis.

Before heading home we flew from London to Copenhagen to attend the Fourth General Assembly of the International Union for the Protection of Nature—the world's only international conservation congress. I was able to participate in the formation of the Union's Commission on Ecology and we joined the excursion which permitted a good look at Denmark and its countryside. This little country is one of the leaders in adopting legislation to establish protected areas for recreation, landscape beautification, and biological research.

At last, 5 months to the day that we left New York, we returned by air, via London and Glasgow. Our trip was a reconnaissance, of course, but we got a good look at some major land problems and what is being done toward solving them. And in addition to innumerable impressions we have real booty in five volumes of notes and a large cache of photographs, both kodachrome and black and white. Most important of all, we established a base for a more thorough understanding not only of the Old World's land resources but our own as well.

Radioactive Isotopes Help Solve Field Problems

By J. C. BROWN and R. S. HOLMES

FRUIT orchards growing on calcareous soils in the western states are frequently afflicted with a serious yellowing of the leaves known as lime-induced chlorosis (fig. 1).

There is a tremendous body of evidence that the trouble is due to the inability of the plant to absorb iron from the soil for use in the growth processes of the plant. Iron may be absorbed in some plants, but later becomes inactivated in the plant and unavailable for growth. Use of radioactive isotopes in research on this problem has afforded a much better understanding of the nutritional difficulties that bring about lime-induced chlorosis.

When radioactive iron was initially present in soybean seed, an autoradiograph (fig. 2) showed that sufficient radioiron was supplied

Figure 1.—Chlorosis in a peach orchard; typical of chlorosis-susceptible plants in numerous irrigated valleys in the western states.

from the seed for growth of the plant on a calcareous soil until the two trifoliate leaves developed. These leaves became chlorotic. The autoradiograph was made by placing the plant in contact with X-ray film in the dark. Radioemanations from the iron expose the film, so

Note.—The authors are soil scientists, soil and water conservation research branch, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

that a light image illustrates where radioiron is concentrated and a dark, poor image reveals a low level of iron. The chlorotic leaves contained much less iron than the rest of the plant. There was not sufficient iron absorbed and translocated from the calcareous soil to the leaves to prevent chlorosis.

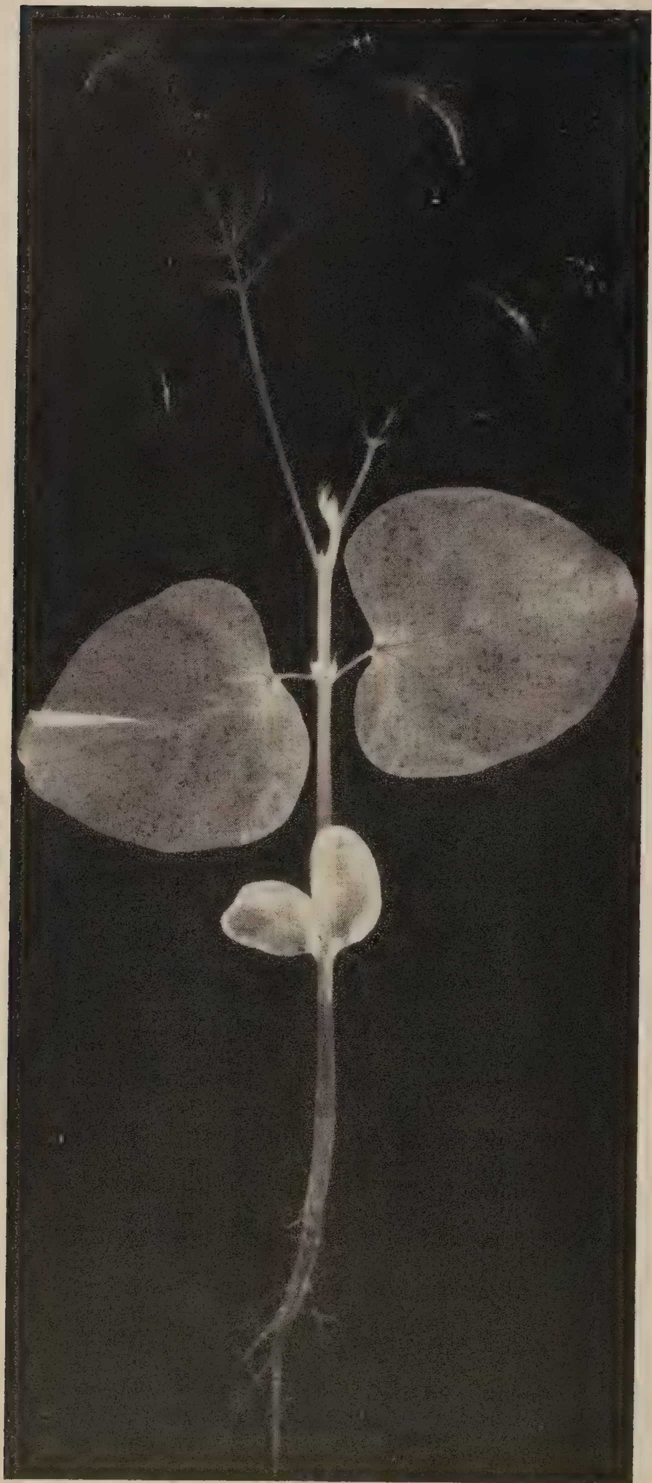


Figure 2.—Autoradiograph which shows the distribution of radioiron from the cotyledons to other parts of a chlorosis-susceptible soybean grown on a calcareous soil. The two trifoliate leaves developed chlorosis and contain less radioiron than the other parts of the plant.

Radioiron was added to the calcareous soil, as ferric chloride, to determine if this iron would remain available for plant growth. Chlorosis-susceptible soybeans were grown on this soil, but they became chlorotic because they were unable to absorb sufficient iron from the soil. This is shown by the autoradiograph (fig. 3) revealing a little radioiron in the roots and lower stems, but practically none in the leaves. That is, the added radioiron was fixed in the soil in an unavailable form.

A chelate, DTPA (diethylenetriamine pentacetic acid) was applied to the soil to determine if it would make the radioiron, *previously added*, available to the plants. Figure 4 is an autoradiograph of the chlorosis-susceptible soybean which shows that the chelate did make

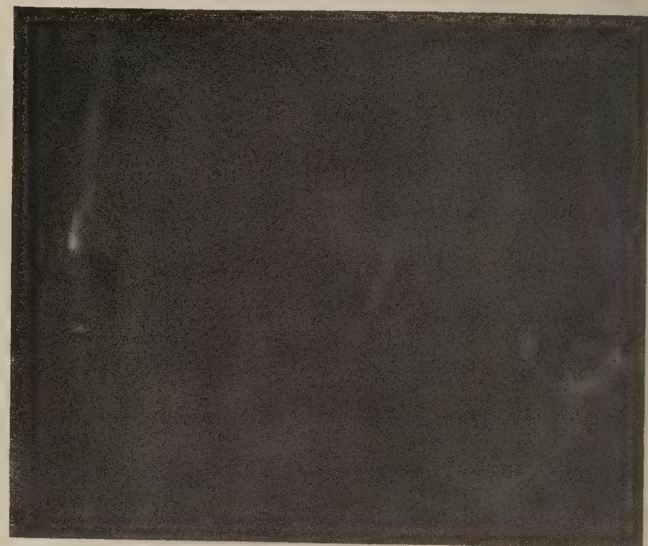


Figure 3.—Autoradiograph which shows the inability of chlorosis-susceptible soybeans to absorb radioiron from a calcareous soil. Note radioiron in roots and lower stems.

No. 4

This is the fourth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Figure 4.—Autoradiograph which shows the ability of the chlorosis-susceptible soybeans to absorb the radioiron from the calcareous soil after the soil was treated with chelate DTPA. Note concentration of iron in the leaf and flower primordia.

the radioiron available and prevented chlorosis. Chelates are chemical compounds which combine with the iron in the soil in such a way as to prevent it from reacting to an unavailable form with other chemicals in the soil. Iron as a chelate was available to plants and the latter developed normally with a good green color (fig. 5). The green plant on the right received chelate while the chlorotic one on the left did not.

The chelate was utilized in making iron already present in the soil available to the plants (fig. 6). Soils which did not contain radioiron, but were treated with DTPA tagged with radioactive carbon, showed that radiocarbon was absorbed and translocated into the leaves, presumably as the chelate. The autoradiograph shows that this radiocarbon was distributed throughout the plant in equal concentration. This indicates that the chelate molecule or some fraction of it is effective in carrying iron from high-lime soils into and through the plant.

Chelate applied at the same rate to a number of different soils produced toxicity symptoms

Figure 5.—A photograph which shows plant response to chelate DTPA added to a calcareous soil. Left, no chelate. Right, chelate added to the soil.

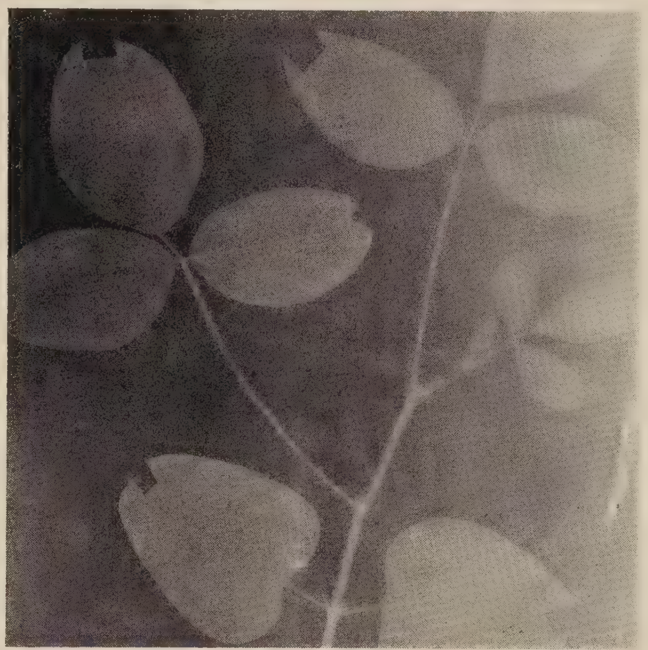


Figure 6.—Autoradiograph which shows radiocarbon of C14 tagged DTPA distributed throughout the chlorosis-susceptible soybean. The chelate was utilized by the plant in making soil iron available.

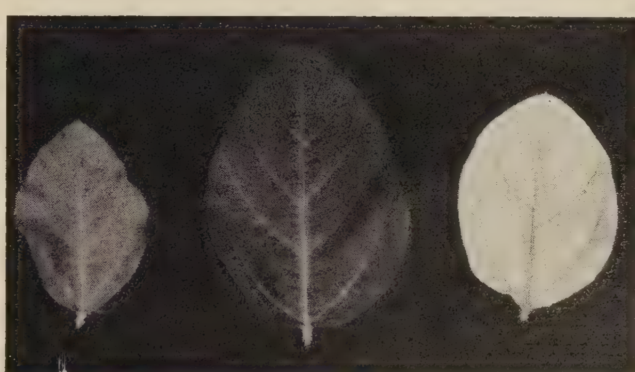


Figure 7.—Leaves from chlorosis-susceptible soybeans grown on soils which received different amounts of chelate. Left, chlorotic leaf; no chelate. Center, green leaf; chelate added to soil. Right, leaf showing toxicity symptoms where too much chelate was added to the soil.

in the plant on some soils, alleviated chlorosis in others, and was only partially effective in

alleviating chlorosis in a third group of soils. This showed the variable effect of the nature of the soil in determining chelate efficiency.

Similar results were obtained by adding the chelate to a soil at different rates (fig. 7). With no chelate in the soil the plants were chlorotic. As the amount of chelate applied to the soil was increased, the plants became green. When still more chelate was added to the soil the plants developed toxicity symptoms. New chelates are constantly being developed which appear more efficient and less toxic than those that have been used. Much additional research is needed before recommendations can be safely made for field applications of chelates to calcareous soils, but current studies have revealed a promising solution to an exasperating field problem.

Several commercial iron-chelate compounds, which have been used successfully in the East, have not been helpful on the western calcareous soil. But, several recent experimental types of chelates appear to offer promise for the western problems on iron nutrition of plants.

Brush Control

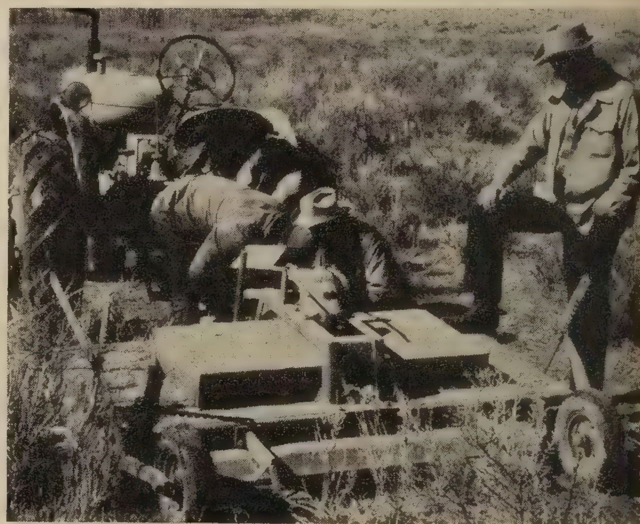
By HARLAN N. TULLEY

THE rotary brush cutter is coming into prominence as a tool for range improvement. With this machine about 2 acres per hour of medium heavy brush can be cleared. The cut material is deposited on the soil as a mulch, thus providing the same soil protection as the standing brush. This provides an excellent seedbed for seeding grass, an advantage if there is not sufficient native grass already present. As might be expected, the best results are obtained on the better soils and gentle slopes. To prevent having weedy annual growth replace the brush, it is necessary to give the treated land rest from grazing during the two growing seasons after cutting to allow establishment of a full grass cover. Fall grazing is permissible during this time.

The kinds of brush, such as rabbitbrush, willows and greasewood, that sprout under the ground are not successfully controlled this way. But sagebrush is easily killed since it sprouts above ground.

Experiments conducted in Wyoming indicate that brush control on native range increases forage production the first year by 20 to 80 percent. After 2 years, the forage production goes up 100 to 200 percent. In Colorado, it was increased 2 to 3 times by this method.

Note.—The author is range conservationist, Soil Conservation Service, Sheridan, Wyo.



One type of machine used to cut brush on rangeland. It uses two power-driven rotary blades which pulverize the brush and drop it on the ground as a mulch. Another popular type of brush cutter is the rotary beater which flails the brush to the ground and leaves it there as a mulch.

In Oklahoma, good sagebrush control was obtained only when the plants were cut close to the ground in June during 2 successive years, and livestock kept off the range from June until fall. Grass density increased 90 percent and carrying capacity 80 per cent. The gain per head was 4 percent and the gain per acre was 76 percent. This increase, coupled with the increased selling price of the cattle due to better physical condition, resulted in double the former return.

June is the best month to cut brush, as it has been found that plant food reserves within the plant are lowest at that time and the plants are most susceptible to control.

REVIEWS

FLOODS. By William G. Hoyt and Walter B. Langbein. 469 pp. Illustrated. 1955. New Jersey: Princeton University Press. $7.50.

TWO hydraulic engineers, well-known in their profession, have written an excellent book on a subject of interest to every farmer and rancher.

It is natural that Hoyt and Langbein, being engineers, should lean toward the opinions of their colleagues on such matters as conservation and small dams. Yet the authors have tried to be impartial, and after promising us bigger and more ghastly floods on the populated valley lands in the future, they offer flood plain zoning, insurance, and forecasting as the eventual solutions to floods on the larger streams. For the smaller streams, they admit that small dams will do some good, but turning the upstream bottom lands into pasture seems the ideal solution to them. Corn Belt farmers may disagree—perhaps their best counter-argument is in terms of steaks from corn-fed steers.

The book was written before both the pilot watershed program and the Hope-Aiken legislation were in operation. This omission in the otherwise comprehensive text is not serious. Five or so years hence, when the effects of the watershed protection projects will be known, Hoyt and Langbein will have new and useful information to add to the second edition.

The book is handsome and its contents well organized. The ten chapters give you such generally unavailable information as the generation and life history of floods; the damages suffered from past floods in the United States and how such damages are determined; a review of legislation and present flood control policy (to 1953); and such useful reference data as the problems, projects, and plans of the major watersheds of the nation, with maps showing sites of proposed and existing large dams, and an historical review of past floods.

Most important of all, there is a review and discussion of what has been done about flood prevention in the past, and what can be—or ought to be—done about floods in the future. The authors have tried to avoid getting into the controversy about big and little dams in their discussion of flood remedies. Another part of the controversy, however, shadows a few of the pages and the neutrality of the authors wavers when they discuss "Stopping the little raindrops where they fall" as a solution to flooding on major streams.

The reluctance of Hoyt and Langbein to accept "land use practices" as a major flood prevention method is based on the lack of streamflow data from conservation treated *large* watersheds. The authors, whose life work has been in connection with the *measurement* of streamflow, are therefore unimpressed by the claims of enthusiasts who have only *seen* conservation work on their own farms or ranches. Measurements are the heart of an engineer. Thus, the evaluation programs now being installed on selected watershed protection projects have an importance greater than their money value. As instruments of persuasion in the engineering field, the measurements now started will be decisive factors in settling controversies—or continuing them. Every conservationist should watch with interest the establishment of conservation practices on those projects.

This book should be owned and read by every conservationist for the facts and the thought-provoking statements that are contained in it, for the book represents—as nearly as possible, these days—a neutral opinion on an important subject.

—VICTOR MOCKUS

THE grass is rich and matted, you cannot see the soil. It holds the rain and the mist, and they seep into the ground, feeding the streams in every kloof. It is well tended, and not too many cattle feed upon it; not too many fires burn it, laying bare the soil. Stand unshod upon it, for the ground is holy, being even as it came from the Creator. Keep it, guard it, care for it, for it keeps men, guards men, cares for men. Destroy it and man is destroyed.

—Alan Paton in "Cry the Beloved Country"

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Big Job Well Done!

NOT in all the history of Scout "good turns" since 1912 have 3 million boys attracted so much interest as during 1954, when 135,000 special projects were carried out in an effort to arouse public recognition of the need for adequate protection and management of America's soil, water, forest, mineral, and wildlife resources.

In February this year 12 Regional Explorers came to Washington and made their "Report to the Nation" to President Eisenhower at the White House. They told the President what Scouts did in conservation during 1954.

Activities included 41,721 projects in soil and water conservation, more than 29,000 in fish and wildlife conservation, 38,125 in forestry, and 30,450 in outdoor manners.

During 1954 Cub Scouts, Boy Scouts, and Explorers planted 6,192,753 trees over the country, mostly on eroded or abandoned land. If these trees had been planted in one straight row they would reach from New York to Honolulu. More than 561,675 hours were spent by Scouts helping conservation officials in outdoor-manners campaigns—cleaning up roadsides, parks, campgrounds, lake sides, streams and other recreation areas. More than 3 1/3 million conservation posters were posted during the year—enough to cover the walls of 2,500 five-room houses.

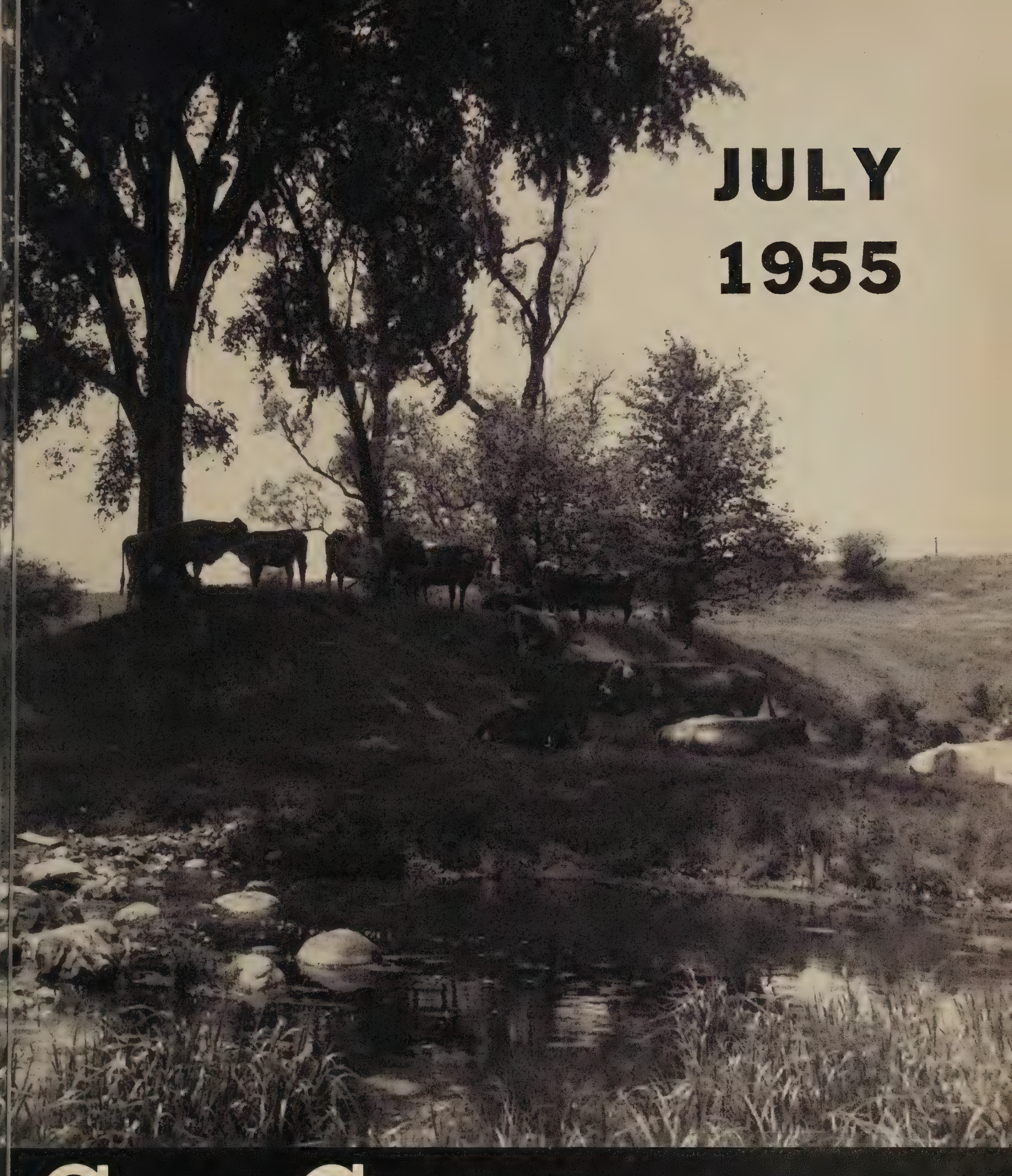
This isn't all. More than 55,000 nesting boxes for wood ducks, squirrels, raccoons, and songbirds were built and setout.

President Eisenhower receives leather-bound report on "Good Deeds." With him: John R. Cookerly, David L. Gerwitz, Charles L. Braun, and James Noblin.

Wildlife was dramatized by both Boy and Girl Scouts. Scouts love birds, animals and fishes. Their projects in fish and wildlife management were for the improvement of the natural environment. Some of the projects purposed to improve sport fishing.

Millions of people were alerted to the conservation needs of our nation, many for the first time. Eleven TV film "trailers" were distributed to 300 stations from coast to coast during the year. These films were used more than 20,000 times, a total of more than 800 hours devoted to the Conservation Good Turn.

JULY 1955



SOIL CONSERVATION

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SOIL CONSERVATION

JULY 1955

VOL. XX—NO. 12

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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OUR SOIL ★ OUR STRENGTH

SIMPLE TEST. — George Griffin of Hodgdon, Maine had heard a lot about soil erosion, so he decided to find out for himself what was happening to the soil on his farm.

He crumbled two pages of a mail order catalogue into wads and placed them in adjacent rows at the top of a moderately sloping potato field with rows up and down slope. A 40-minute, half-inch rain followed immediately.

After a long search Griffin found the paper wads in woods 30 feet beyond the edge of the field and 100 rods from the spot he had placed them. The runoff had deposited 2 inches of soil on the sod headland. In the woods Griffin found more than a foot of topsoil carried down by previous runoff.

Griffin at once applied to the supervisors of the Southern Aroostook Soil Conservation District for assistance. A Soil Conservation Service technician helped plan and install a stripcropping system. Soil losses now are at a minimum, and estimated yields are up by at least 15 percent.

—JOHN W. HART

Editors are invited to reprint material originating in this magazine.

FRONT COVER. — Contented Brown Swiss cows on pasture in Fond du Lac County, Wis., where there is plenty of good grass, pure running water, and shade.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Spreading Water to Conserve It

Science is tackling the complicated problem of underground water storage. Little by little, the methodical research being conducted by cooperating agencies and institutions is getting at the challenge of underground reservoirs waiting to be filled. This is an authoritative article on a matter of importance to the agricultural future of millions of arid and semiarid acres.

By **LEONARD SCHIFF, ELDRED S. BLISS and CURTIS E. JOHNSON**

No. 5

This is the fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

WATER conservation and soil conservation go hand in hand. Measures like contour cultivation, basin listing, stripcropping, and terracing conserve the water as well as the soil. However, such conservation of water is inadequate for replenishing ground water where pumping exceeds natural replenishment.

Where natural replenishment is inadequate, wells have dried up and farms have been abandoned. In other areas wells have had to be deepened until pumping costs consume much of each year's profits. In the San Joaquin Valley, Calif., where the investigations reported herein are being conducted by the western soil and water management section, soil and water conservation research branch, Agricultural Research Service, average pumping lifts have increased from about 20 feet to 10 times that depth in a 40-year period. Farmers on millions of acres of arid and semiarid land depend on pumping as their only possible source of water for crops. In humid areas more farmers are depending upon supplemental supplies for irrigation by pumping to carry them through drought periods. Agricultural, industrial, and domestic demands are depleting ground water supplies at an alarming rate.

The conservation of water by storage is frequently thought of as a surface job. Yet, beneath the surface of the ground there are subsurface basins with unused storage far in excess of the largest surface reservoirs. In many localities surface reservoirs have been constructed on the usable sites. This does not imply subsurface storage basins and surface reservoirs are in competition, oftentimes they supplement each other. It does mean that the subsurface storage basin has been neglected, and has potential because of its unused capacity, availability, and low evaporation loss. Water in excess of carefully planned irrigation use, floodwaters, waste waters, and water saved by avoiding excessive evapotranspiration can be stored in these subsurface basins. Additional

Note.—The authors are, respectively, research project leader, soil scientist, and soil microbioligist, western soil and water management section, soil and water conservation research branch, Agricultural Research Service, Bakerfield, Calif.

Projecting screen attached to sand filter over gravel-filled shaft in operating pond. The protruding pipes are piezometers.

water from other areas where natural excesses exist or are produced by conservation may be conveyed to areas with depleted ground water. Most of the excess water will be available in wet years. Frequently water is available for storage when irrigation demands are low and the irrigation system or additional systems may be used to convey water to spreading sites. Available water may be diverted over subsurface basins to infiltrate through the soil and percolate downward to the ground water table. This is known as water spreading. Another form of water spreading is to inject water beneath the ground through wells, pits, and shafts.

The October 1949 issue of SOIL CONSERVATION Magazine contained two articles on water spreading. A. T. Mitchelson described the methods of spreading water on previous soils with subsurface conditions that would permit rapid flow to the ground water table. His article discussed methods of spreading water on the surface, the use of protected diversions, revetments, and dike controls, and the bypassing of silt-laden waters. But in many areas where replenishment is required, soils are not very pervious. Glenn K. Rule, of the Soil Conservation Service, utilizing data supplied by Mitchelson, wrote about experimental work to make water move more rapidly into the less pervious soils. Such an accomplishment would reduce the amount of valuable land needed for spreading and would localize water where desired. He described how the rate at which water entered the soil on small test ponds was increased from a maximum of 3.6 feet per day to 14 feet per day by treating the soil with cotton gin trash. Benefits had lasted 3½ years at the time he wrote.

At the time of Rule's article the experimental work was a cooperative project by the Soil Conservation Service, the Kern County Land Company, the Bureau of Reclamation, and the California State Division of Water Resources. These same agencies are still interested or active in this work, and they have been joined by the University of California Agricultural Experiment Station and the United States Agricultural Research Service.

This cooperative research deals with fundamentals of how and why water moves through soil under long submergence, what are the

Chlorinating water supply of ring test pond.

forces that influence this movement, and what can be changed to increase the rate at which water enters the soil. This entry rate is called the infiltration rate. Treatments designed to enlarge soil pores, develop stable soil aggregates, or open less pervious subsurface layers are being studied. A major problem is clogging of the soil pores after water spreading is underway. Studies show that clogging can be caused by movement, slaking, swelling, or settling of soil particles, or by microbial activity. It is important to find treatments that overcome this clogging, and thus permit high infiltration rates to continue over spreading periods of several months. In this connection, more work has been done on the cotton-gin-trash treatment mentioned earlier. Recent computations show infiltration-rate averages for a 200-day period were 1.0 foot per day on an untreated test pond and 5.8 feet per day for a cotton-gin-trash treated test pond.

Now, let us see why this treatment works and what other treatments are being tested. Test ponds treated with cotton gin trash several years ago produced high infiltration rates after the first or second run and still exhibit high rates when they are appropriately dried between runs. During the first and usually the second runs, cotton gin trash is decomposed by microorganisms. These microorganisms produce gases, liquids, and solids which clog the soil and reduce infiltration rates. But upon drying, these secretions bind the small particles of soil together into rather stable crumbs or aggregates. This wetting and drying has been called "incubation." Incubation also develops larger, more stable pores through which water can readily move. And because the pores are larger and more stable, clogging is more difficult. Thus, high infiltration rates last longer.

Studies show that cotton gin trash does better than barley straw, alfalfa, rice hulls, and some other organic residues which have a somewhat similar effect. So far, cotton gin trash appears to be best for the San Joaquin Valley because of its decomposition rate, decomposition products, and rather lasting benefits. Also, it is a waste product free for the hauling. There is, however, the cost of hauling, distribution, and incorporation in the soil. Other organic residues may be more readily available and beneficial elsewhere.

During early experimental work benefits from growing grasses were described as good but less beneficial than cotton gin trash. Continued experiments have shown that it takes a few years to establish a good stand of grass. Well-established bermudagrass on a small test pond has produced infiltration rates similar to well-decomposed cotton gin trash. The vigorous growth of roots and the active decomposition of various plant parts produce soil conditions favorable for infiltration. This grass can stand severe droughts and partial submergence. Different grasses may be suitable in other places. Grasses on large spreading areas may also provide hay or a forage crop, a very important consideration.

What about the use of some of the new soil conditioners? Laboratory studies showed that some conditioners increased the rates at which water moved through tubes packed with several different soils and maintained rates much higher than untreated tubes for 6 months or longer. The next step was to check conditioners in the field. One kind of conditioner (known as vinyl acetate maleic acid type) increased infiltration rates almost as much as cotton gin trash. A second kind, (ammonium lignin sulphonate and wood sugars) much less costly, approximately doubled the normal infiltration rate. A third type gave no improvement on a sandy loam but has been reported to be effective on heavy clays.

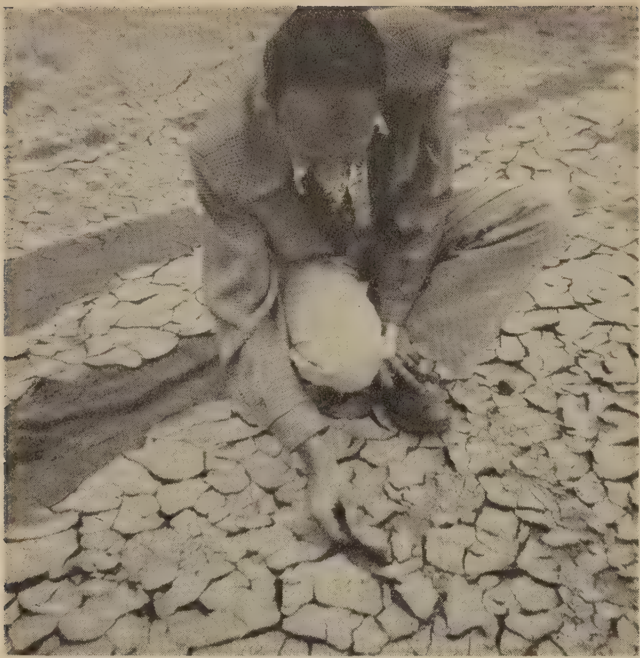
Infiltrometer for determining the infiltration rate.

The immediate benefits of soil conditioners seem to give them an advantage over vegetative treatments. This was a major reason for their trial. However, benefits produced by conditioners do not seem to last so long as those produced by vegetative treatments. On the third run of a test pond treated with a conditioner and supplied with clear water, infiltration rates declined to about one-half those in the first run. Observations in the field indicate that vegetative treatments can keep a soil more friable and open than soil conditioners when the water contains small amounts of silt or debris. Such factors as type of soil, cost of application, length of benefits, and needed infiltration rate must be considered, however, in deciding on the relative merits of any treatment. These will vary according to localities.

Chemical treatments such as gypsum, calcium chloride, detergents, and germicides have been tried with comparatively little success. Mechanical treatments such as removal of surface soil, breaking up surface crusts, and cultivation also have been only slightly beneficial. As more information is obtained on all the basic factors involved some of these treatments may well find a place. Combinations of treatments sometimes may be required. For example, a soil conditioner may help aggregate loose material developed during a ripping operation, or improve soil conditions while a grass is being established. Treatments may fail simply because they have been used improperly. For instance, soil conditioners require such a light rate of application that they have been difficult to distribute in a soil. Sometimes a treatment is expensive because 6 inches of a soil is treated; perhaps a 1-inch treatment would produce almost as much benefit. These are challenges to research.

It may be noticed that improvements mentioned so far have taken place in the laboratory or on small test ponds. What about large-scale treatments?

The development of a large spreading area


Clogging crust on injection trench curled on drying.

requires heavy machinery to level land and build dikes. This operation breaks down the original soil structure and compacts soil. On several recently constructed large spreading areas infiltration rates turned out to be too low for practical use, because the soil had been damaged by the heavy machinery. It appears that land should be leveled only to control the water. To help keep machinery off most of the spreading area, dikes can be built from cuts closely parallelling them.

Because cotton gin trash worked so well on small ponds, it was one of the first treatments tried on a large area. Gin trash is bulky and hard to handle, and a lot of it is needed to give results. After spreading, this material is disked into the soil surface to prevent floating and piling up by wind. Cotton gin trash incorporated at rates of 50 to 100 tons per acre on a newly developed spreading area did not appear to be effective. However, when these basins were ripped to relieve compaction, infiltration rates on some basins doubled and tripled to reach what is locally considered a "practical rate" of 1.5 feet per day.

The infiltration rate achieved with cotton gin trash on large areas was a far cry from the 14-foot rate on small test ponds. Why? We believe the limitation was due to a subsurface condition. Small pipes called piezometers were driven to various depths in the soil to help answer the question. These piezometers are open at the end so that water can enter at the bottom. They showed that perched water tables occurred on top of some less pervious stratified layers. Piezometers that ended in these less pervious layers showed no water. These subsurface layers, then, were retarding downward movement of water. Infiltrometers built out of 9-inch pipe were driven a few inches into the soil. Water was maintained on the soil surface in these infiltrometers. Infiltration rates were 4 or 5 feet per day. When the infiltrometer was driven down so that it was in contact with the hardpan, a rate of 0.6 foot per day was obtained. This rate approached the average infiltration rate of the large spreading area on this soil.

These less pervious layers do not reduce the infiltration rate of a small test pond because water building up on the less pervious layers beneath a small test pond flows away laterally. A large area may be considered to consist of a large number of small ponds. Flow beneath the inner ponds is held largely to vertical flow downward by the outer ponds.

An example of the effect of operational procedures and lateral flow on infiltration rates follows. Two one-half acre adjacent basins were constructed by building the dikes from the outside. On one basin a soil conditioner was incorporated to 3 inches in the surface soil by rototilling. The other basin was rototilled without conditioner. Light equipment was used. On the first run infiltration rates averaged 2 feet per day on each basin, as contrasted to about 0.5 foot per day on a surrounding large spreading area. When water was removed from the surrounding area, both one-half acre basins had an increased opportunity for lateral flow if subsurface layers were retarding infiltration. The conditioner-treated basin increased in infiltration rate, indicating a better surface condition than on the untreated basin. This also indicated that the flow was limited by less pervious subsurface layers.

What can be done about these less pervious subsurface layers? Ripping and extending shafts, trenches, pits, and wells through such layers are being tried. Thought has been given to leaching chemicals downward to act upon the less pervious layers. In the San Joaquin

Valley ripping has been tried on shallow hardpans and stratified layers. Preliminary results varied from little gain in some areas to almost doubling infiltration rates in others. These differences are now known to be due to discontinuities that occur in the limiting layer in some areas, or to the layers being too deep to reach with the ripper.

Where pervious sandy layers underlie less pervious soil, gravel-filled shafts 4 feet in diameter and 20 feet deep have been tried as a method of carrying down water. A projecting screen is attached to a sand and gravel filter over such a shaft. The maximum injection rate through one shaft was equal to the average infiltration rate on 1 acre of land nearby. However, the injection rate declined with time. Head loss measurements indicated that a drop in water pressure occurred across the surface of the coarse soil layers where they contacted the gravel in the shaft. Sand filters had been used to prevent material from entering the shaft. However one side of the shaft sloughed during the run and this material apparently caused much of the clogging.

Another possible clogging agent is bacterial activity. It may be desirable to restrict microbial activity by chlorination, as has been done in tests elsewhere. This is costly. The effect of chlorine on microbial activity and organic matter is being studied on another small test pond. If relatively cheap, satisfactory shafts can be developed it may be more economical to drill new ones occasionally than to use chlorine. This assumes that chlorine will be beneficial. Future research also considers the use of a backfilling material such as coarse sand which may stabilize the sides and filter out material at the surface. The surface of the filter may be removed when clogged and replaced.

Mixing a soil conditioner into soil of test pond.

Trenches and pits have been tested for recharge purposes. Satisfactory rates of 6 feet per day were obtained in a pit 10 feet deep contacting sand. A trench gave injection rates of about one-third those of the pit, due partially to surface clogging. Piezometer measurements showed high losses of head due to friction at the surface of the ditch. A few small portions of the trench treated with a soil conditioner appeared stable. Infiltration rates determined with infiltrometers were three times higher on the conditioner-treated portions than on the untreated portions.

To design a water spreading basin properly there is a need for information on both surface and subsurface conditions down to the water table. On large areas used for spreading, surface treatments should be limited to keep the water moving through the surface as fast as it can move through lower soil layers. If the natural surface intake rate is high enough but has been reduced by heavy machinery, surface treatment is costly. It may pay to allow the soil to recover to normal over a period of time by wetting and drying, natural vegetative growth and other factors. Manipulation of soil should be held to a minimum. Where the infiltration rate of the surface soil is appreciably below that of subsurface layers, major treatments to increase the rate through the surface may be fully justified. The capacity of the basin, the positions of limiting layers, and the length of time during which given quantities of water are available must be considered.

Further developments of operational procedures are necessary to apply treatments originating from the laboratory and small test pond. Systems of spreading are being studied. For example, if the rate of flow through the surface is considerably higher than the rate of flow through subsurface layers, spreading on relatively long narrow strips may allow as much water to enter the basin as would flooding the entire surface. Treatment could then be con-

fined to the strips. Farming or other land use might be possible between strips.

A rotational system in which some portions of the area are flooded while some are dried, warrants more investigation. Portions would be flooded only while infiltration rates remain high. These portions would be dried more frequently for recovery of infiltration rates.

Soil surveys and laboratory tests on the physical and chemical properties of the soil and water help to determine the suitability of a surface soil for absorbing water. Logs of wells, jetting exploratory holes into the soil, and cable tool test wells help determine subsurface conditions. The infiltrometer also is a worthwhile tool. Infiltrometers were used to determine both infiltration-rate curves for watersheds and for potential water spreading areas in the Tehachapi (Calif.) Soil Conservation District. This work is described by R. E. Ballard in SOIL CONSERVATION Magazine, December 1954. Investigations of runoff and spreading sites indicated the feasibility of spreading the runoff from some of the watersheds. A spreading ground has been built to conserve the water from one watershed as a result of these investigations.

Soil surveys and infiltrometer runs were used to determine suitability of conditions for spreading water on the proposed El Rio Spreading Ground in Ventura County, Calif. Good subsurface conditions, indicated by the few available well logs, were substantiated by some new cable tool test wells. Infiltrometer tests indicated that satisfactory recharge rates would exist under water spreading conditions. A check was provided by comparing infiltration rates obtained with infiltrometers installed on the nearby Saticoy Spreading Ground against infiltration rates obtained from actual spreading runs.

The El Rio Spreading Ground is now under construction by the United Water Conservation district and will be supplied with water diverted from the Santa Clara River.

The growing countrywide interest in ground water replenishment requires increased support of research in water spreading techniques. The writers gratefully acknowledge the extensive facilities and help made available by the Kern County Land Company and the North Kern Water Storage District, without which a number of the field experiments described here could not have been conducted.

Rain is Slim but Cattle are Fat

This is the story of a quick response by grass and beef to the management genius of young Bob Sprowls. Conservation ranching enables him to make money and to have a part in the program of upstream flood control.

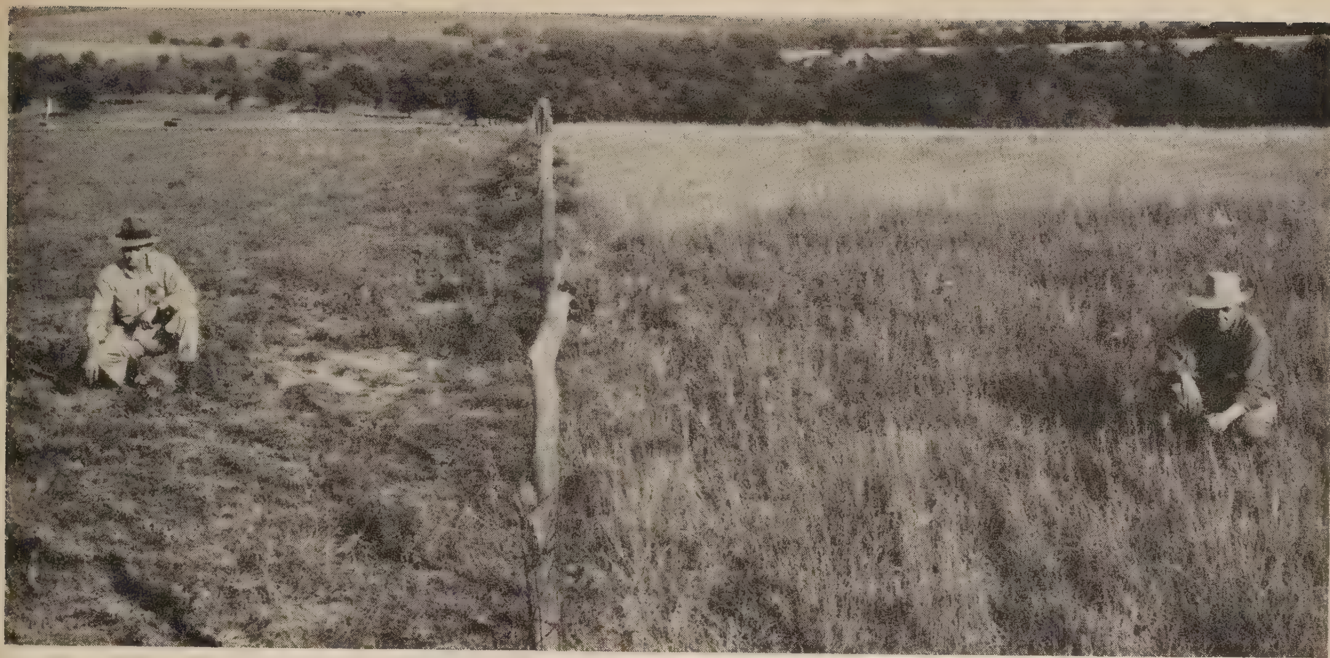
By **CHESTER F. FRY**

INCREASING beef production 5,440 pounds per year while at the same time reducing his cow herd from 168 to 100 animals is the significant achievement of young Bob Sprowls, conservation rancher, who operates a spread near Elk City, Okla. Sprowls took over the management of the ranch after graduation from Oklahoma Agricultural and Mechanical College in 1951.

The ranch consisted of one pasture of 2,520 acres with 168 head of commercial beef cows and about 50 head of yearlings. The yearlings were sold in the fall of '51. The next year Bob raised 73 calves, most of them dropped in the summer. He sold them at an average weight of 400 pounds—a total of 28,600 pounds.

Young Sprowls was not satisfied with either the rate of production or the condition of his grass. He dissected his situation with Fred Whittington, a top-drawer range conservationist at Elk City. Fred and Bob worked out a conservation plan. It was important to balance

Note.—The author is range conservationist, Soil Conservation Service, Ardmore, Okla.



Left, overgrazed; right, mowed once and deferred from grazing for one year.

the livestock number with the available grass, and leave enough growth on the grass to build up the range—as Fred put it, simply "take half and leave half."

Bob started his new program by culling his herd and selling 48 head of cows. Then he seeded 100 acres of formerly cultivated land to native grass. One big pasture was cross-fenced into three smaller pastures to make better management possible. One pasture was rested through the growing season for winter use, and 350 tons of silage were put up from the cultivated land. He penned his bulls to regulate calving dates.

Results came the very first year. Young Sprowls sold 2,600 more pounds of beef than he had the year before. The calf crop increased from 44 percent to 65 percent. The average cow was 260 pounds, as against 170 in 1952. This was done with the same amount of hay plus 170 tons of silage. At the same time, he reduced the protein supplement from 25 tons to 3 tons.

After this experience, Bob sold 20 more cows, leaving a herd of 100. In 1954 he sold 34,040 pounds of calves. He produced an 80 percent calf crop, with an average of 340 pounds per cow. Profits have gone up even more than production. Feed bills are down, and so are operating expenses, interest, and taxes.

The grass? Fred Whittington reports a very definite improvement in spite of drought conditions. Rain gages near the ranch recorded 13.32 inches of rain in 1952, 16.8 inches in 1953, and 20.09 inches in 1954. This is in contrast with an average of nearly 22 inches per year.

Conservation ranching is paying off for Bob Sprowls, but the benefits don't stop there. He is doing his part in the land treatment program carried on by his Upper Washita Soil Conservation District. This is a very important part of the upstream flood control program being established on the Washita River watershed. The biggest reservoirs are in the soil itself.

Conservation ranching keeps the soil in condition to absorb large quantities of water, thereby helping to reduce floods. To illustrate, tests were made near Ardmore, Okla., in August 1951. A fence-line contrast on a typical prairie upland range site was selected. One side of the fence was well managed, moderately grazed range in excellent condition—a part of the Daube's IS Ranch, cooperators with the Arbuckle Soil Conservation District.

The other side of the fence was overgrazed, range in poor condition, a pasture rented out a year at a time with no grazing restrictions. A concentric ring infiltrometer was used to determine the infiltration rates on the two condi-

tions. In a 2-hour test, the excellent condition range took up 10 inches of water compared with 4 inches on the poor condition range.

After the first 15-minute period, the excellent range continued to take up one or more inches of water each 15 minutes while the poor range gradually took water at a slower rate, finally dropping to only one-fourth the rate of other's intake. Under natural rainfall, there would have been yet more contrast as the force of raindrops would churn the soil and seal the surface on the poor range.

Thermometers were used to measure the effect of range cover on soil temperature. The test was made under a cloudless sky with the air temperature at 105° F. The soil temperature was 95° F, under a cover of excellent condition and 135° F under poor condition. There would be very little, if any, activity of beneficial soil organisms at the higher temperature and the evaporation would be much higher.

Clippings were made to measure the amount of ground cover. The excellent range had 5,500 pounds per acre of standing forage, including some from the previous year's growth. There were 2,000 pounds per acre of mulch or litter on the soil surface, making a total of 7,500 pounds per acre of protective cover. The poor range had 1,750 pounds per acre of vegetation, but no measurable amount of mulch or litter.

Studies made with ranchers in this area indicated that moderately grazed, excellent condition range similar to Daube's produces at least three times as much beef as overgrazed, poor condition range. Conservation ranching will increase the production of this poor condition range just as it did on the Bob Sprowls ranch.

Grass is the crop of the rancher and stockman whether sold as hay, beef, wool, milk, or mutton. Conservation ranching produces more grass.

Windbreak Strips Protect Watermelons

In Florida farmers are growing blue lupine and small grains to discourage sand blowing and to improve the soil.

By DAVID P. VENTULETT

WINDBREAK strips between watermelon beds have proved profitable to farmers in Central Florida, according to R. E. Word, chairman of the Sumter Soil Conservation District. The soil losses and damage to watermelon vines caused by March winds in this area have been cut to a minimum through the use of such windbreaks. Blue lupine is the plant principally used for this purpose but small grains such as rye and oats are also effective.

In 1954 Florida produced 23 percent of the Nation's entire watermelon crop. Peninsular Florida planted 65,300 acres, or 62.5 percent, of the State's crop. Practically all of this acreage was subjected to damage by early March winds.

Watermelons are usually planted on "new ground" to reduce the insect and disease hazards. Most of these "new ground" areas are composed of light sandy soils that are very susceptible to wind erosion. "Young melon vines are severely damaged by the cutting action of blowing sand and by being whipped about by the wind which knocks off the blossoms," Word says. "Although planting windbreak strips of blue lupine increases cost, the method does insure the setting of a crop of melons on the vines."

Inasmuch as a large percentage of watermelons is produced on "new ground," growers try to locate areas having as sparse a stand of trees as possible. This leads to the clearing of sandy blackjack oak ridges. These so-called ridges are usually undulating, composed of land

Note.—The author is area conservationist, Soil Conservation Service, Ocala, Fla.

Watermelon rows 12 feet apart with two rows of blue lupine in middle.

in Classes III, IV, and V which is very susceptible to wind erosion.

The field is bedded in 10- to 12-foot beds. Fertilizer is applied in a furrow down the middle of the bed about 30 days prior to planting the melon seed. The date of planting varies with each grower, depending on his guess as to the last killing frost. The race is then on to ship the first carload of melons.

Windbreak strips are planted in late October or November, using one of two methods. The most popular is to drill two rows of blue lupine, with corn planters, between each two watermelon beds. The lupine rows are usually from 1 foot to 2 feet apart. The other method is to solid-plant the entire field to lupine. A few weeks before melon planting time the watermelon beds are plowed up, leaving strips of undisturbed lupine between beds. This method costs more but furnishes an excellent soil building crop for the melons.

Small grains, such as oats and rye, have been successfully used in the area for windbreaks. Rye, principally Florida black or abruzzi, has a slight edge over oats, as it grows taller, thus giving better protection. Many methods of planting the windbreak strips between the melon beds have been used, depending on the equipment the farmer has at hand. Most popular, however, is to drill two rows spaced about 1 foot apart between the melon beds with a corn planter, using plates adapted to the task.

It has been found that windbreak strips give the best protection from wind damage when they run east and west. The most damaging winds are from the southwest.

Farmers in the Sumter and Pasco Soil Conservation Districts are finding that land having Pensacola Bahia or Pangola grass sods that are 5 years or older will produce excellent watermelons. The strips pay off double, for after the watermelons are harvested and the land disced a better-than-ever grass pasture soon volunteers. On the better soils this practice fits in nicely with the grass based rotations that SCS technicians are recommending.

Planted solid to blue lupine in November; plowed in February into strips for protection of watermelons against wind damage. Lupine strips are about 4 feet wide with watermelon rows between.

On new-ground melon fields, the land is disced immediately after harvest and seeded to a mixture of Alyceclover and Pensacola Bahia grass. The clover is either harvested for seed or cut for hay. The Pensacola Bahia grass then takes over and furnishes high quality pasture.

"The windbreak strips of lupine, oats and rye, coupled with the use of sods in the crop rotation system, are enabling conservation farmers to protect their watermelon land in Central Florida," Word says. "These simple practices, with other conservation measures which are included in complete soil conservation plans, make it possible for farmers in our district largely to eliminate some of the risks in our farming operations. We no longer have to look at the dust clouds during the spring months with a feeling of hopelessness; the answer to a major problem has been found and is spreading rapidly to other farmers."

Leveling with a 13,000-pound cutaway disc pulled by tractor.

Deep Plowing to Fight the Wind

This method, on test in Missouri, brings up clay to anchor the sand and produce a soil structure resistant to blowing.

By GAYLORD H. WISNER

SIX years ago when Dunklin County, Mo., farmers established their soil conservation district, one of the major problems confronting them was wind erosion. Approximately one-third of the county was faced with this problem.

A number of practices to combat the problem, were introduced at suggestion of SCS technicians, among them wind stripcropping and adapted grasses and legumes. The latest practice is deep plowing—*as much as 40 inches*—for the purpose of turning over the sand and developing a better soil structure.

Thousands of acres in Dunklin and other counties in southeast Missouri and neighboring Arkansas, are confronted with the same problem. Fortunately, the sand layer is sufficiently shallow to be tied down by a clay layer brought up by deep plowing. Lack of uniformity in the subsoil here is the rule rather than the exception, but it appeared that in all cases a mixing operation with the very fine sandy topsoil would greatly improve the soil structure.

This last March Nelson B. Tinnin, chairman of the board of supervisors and a commissioner on the State Soil Districts Commission, succeeded in interesting a local equipment company in starting some deep plowing.

Tinnin, in cooperation with the company, test-plowed a 40-acre tract. This piece of land will be watched closely during the next few years.

Dunklin County is cotton country and its sandy soils, where blowing can be controlled, are capable of producing a bale to the acre. With this new practice and with proper use of fertilizers it is believed that even this good yield can be materially bettered.

Note.—The author is work unit conservationist, Soil Conservation Service, Kennett, Mo.

Plow in action on Nelson B. Tinnin farm southwest of Hornersville in Dunklin County, Mo.

Immediately after plowing to average depth of 40 inches, and before leveling. The field was gridded at 100-foot intervals and borings taken on the grids.

DISTRICT PROFILE

ADAM F. WYSOCKI of NORTH DAKOTA

GOOD conservation management has transformed land that was nearly worthless 15 years ago into a profitable farm enterprise for Adam Wysocki, of Walsh County, N. Dak. Wysocki is one of the founders of the Three Rivers Soil Conservation District.

He acquired 280 acres south of Minto in 1941. Since then Wysocki has gone on to produce consistently high yields of wheat and sugar beets, and his tall wheatgrass took first honors at the North Dakota winter show in Valley City, first at the State Potato Show, and second at the International Grain and Livestock Exposition at Chicago in 1954.

There was a large salt "flat" on the Wysocki farm that wouldn't even grow saltgrass. Another area had dense brush. There was crying need for land management practices.

Adam Wysocki helped to launch the Three Rivers District, which takes in the 16 eastern townships in Walsh County. He was elected a district supervisor and became chairman at the first meeting in 1943.

Originally, the farm included 153 acres of cropland. This has been expanded to 211 acres by clearing out trees, digging ditches, and using tall wheatgrass in combination with drainage systems to improve the salty soil areas so that salt-tolerant crops such as barley and beets could be grown.

The Wysocki farm is noted for its production of certified dryland grain and beets. It carries no livestock. Many times this Minto conservationist has cooperated with the North Dakota Agricultural College at Fargo to increase seed crops such as Carlton durum and Rival, Mida, Lee, and Selkirk wheat. In 1951 he produced certified foundation stock tall wheatgrass.

High quality grain and sugar beets come from the Wysocki farm. Its average sugar beet yield runs 12 tons per acre. Quite often it goes to 14 tons, and one year it went to 18 tons. The wheat harvest is 40 bushels to the acre; the highest yield obtained since soil practices were put into effect hit 46 bushels.

Adam Wysocki

In recognition of his exceptional soil conservation work, Adam Wysocki was elected a director of the North Dakota State Association of Soil Conservation Districts and last year was made president.

Since the disastrous floods of 1948 and 1950, Wysocki has been behind a move to get the Soil Conservation Service to survey the Forest River watershed area. He is a director for Walsh County on the Red River Watershed and Flood Control Association. He has worked with the corps of army engineers on surveys of flood damage along Forest River.

For many years, this farm leader was community committeeman for the AAA and its related price stabilization and conservation activities. He was a 4-H club leader for 10 years and served as treasurer of his rural school board. At present he is president of the Farmers Elevator Association at Minto, a position he has held since 1946; a director for Walsh County in the Red River Valley Beet Growers Association, and a director of the Minnesota-North Dakota Sugar Beet Development Association.

While his principal interests have continued to be in farming and crop yield improvement through soil conservation, Adam Wysocki has also found time, in recent years, to bring his talents to bear in urban affairs. He has been president of the Minto city council since 1942, and he has worked with others on water and

sewage projects and on establishing a fluorescent street lighting system.

Constantly alert for grasses or grains that will grow on salt-burdened land, Adam Wysocki in 1949 obtained 40 pounds of tall wheatgrass from the Soil Conservation Nursery at Mandan, N. Dak., and started a seed-increase plot. From this plot came certified foundation seed. Now, he supplies his neighbors with good seed from other plots in his conservation rotation system.

"Even the fertile lands of the Red River Valley need careful soil management if the tremendous production achievements of past years are to continue," Wysocki said not long ago. As to the nearly barren soil which he has transformed, he gives full credit to proper land management and conservation practices.

Adam Wysocki is a native of Walsh County in the heart of the Northern Red River Valley. He was born on a farm near Minto, in the area where he continues to make his home. He and his wife have three children. A son, Earl, operates a farm of his own nearby. Lorraine is married to a member of the United States Air Force, and another daughter, Judy, is a student in high school.

—GORDON L. BRACKETT

Out of the Desert, a Farm

By WILLIAM H. ATKINSON

It takes a lot of water for a thirsty land. Here's one glimpse of the large irrigation reservoir on the Hemler place.

HOWARD Hemler and family literally have carved a farm out of the desert. Using a conservation plan, good judgment, and hard work, in 20 years they developed a piece of creosote brushland into a highly productive farm.

Howard came to Carlsbad, N. Mex., from Louisiana in 1920, with his father and mother. They settled in La Huerta. His father was a farmer and it was through him that Howard learned to appreciate the importance of taking care of the soil.

Note.—The author is work unit conservationist, Soil Conservation Service, Carlsbad, N. Mex.

In 1935, with considerable ambition but very little cash, Howard bought his present farm, 4 miles south of Carlsbad. At the time the 240 acres were nothing but creosote brushland.

The first year, Howard put down a small well and planted 2 acres of cotton. In the thirties any start was a good start. "My rotation was sound: 2 acres of cotton and 238 acres of native grass," he said. He had employment at a potash mine, "To keep beans on the table."

The big turning point came in 1940. That year he drilled a well that pumps approximately 1,700 gallons of water per minute. It enabled

Hemlers at irrigation well.

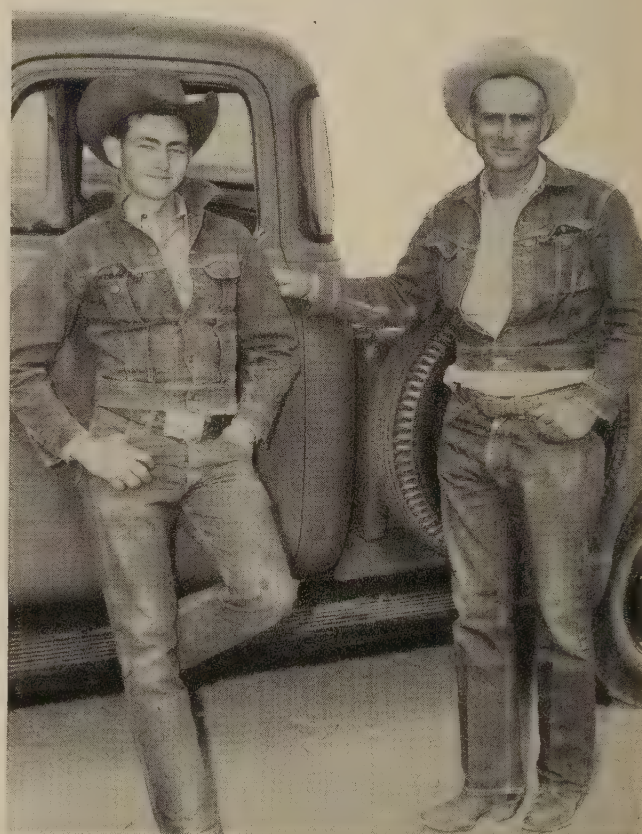
him to put most of his land under cultivation. But irrigating was not easy. Yields were low, water was wasted. In 1950, after the Carlsbad Soil Conservation District came along, prices improved, more labor was available, money was more plentiful. Howard signed as a district cooperator. With assistance of SCS technicians he got his conservation plan going. It included leveling land, laying out fields so that two fields could be watered from one ditch, eliminating other ditches and releasing land for the production of crops, permanent irrigation structures, concrete-lined ditches, soil improvement, and fertilizing. Within a year he had completely reorganized his irrigation system, leveled 200 acres, followed his soil improvement program, and put many conservation practices in effect. It was this year that Howard won the New Mexico Bankers Association Conservation Award for completing 90 percent of his conservation plan.

In 1952, he purchased more land, got 400 acres under irrigation. At last, after 20 years, he was able to stop working at the potash mines. His whole time was now taken up supervising his farm. The expanded farm has received the same conservation treatment as his original home place.

As of today, Howard has leveled 400 acres, installed 122 headgates and drop structures, purchased an adequate number of irrigation siphon tubes, concreted 4,100 feet of ditch, practiced crop rotation, and followed a soil-building program.

The main feature of Howard's conservation program is that it has paid its own way. Production has doubled and in many instances tripled. Fifteen to eighteen tons per acre of barnyard manure were applied to the cut areas which occur in land leveling. Commercial fertilizers were applied in sufficient amounts. Improved varieties of seed were planted. Dusts and sprays for insects and disease control were used. Land was leveled for the most efficient use of water. Correct amounts of water were applied, and at the proper time.

He also has increased his livestock program every year. "If I get nothing but the manure," he says, "I have made a profit on my animals." One hundred fourteen steers are being fed and a daily increasing number of hogs. Feed grown on the farm are being fed all of them, except for some meal and minerals. A bumper crop of grain sorghum is doing most of the job, with the help of a volunteer crop of barley which furnishes grazing all winter. The barley crop is another example of planning and not just a lucky break. After the winter barley was taken off, Howard disked the ground, so if a rain did come he would get some good grazing from a



Young Pardoe Hemler and dad beside pickup truck.

"Pretty good job of leveling, don't you think, son?

volunteer crop. If it did not rain he had lost nothing—but it did rain.

Howard's achievements have not gone unnoticed. In 1951 he received the Bankers Award already noted. In 1954 he was elected to the Carlsbad Soil Conservation District Board of Supervisors, and in 1954 also he was chosen by the New Mexico Association of Soil Conservation District Supervisors as the best conservation farmer.

Explorers Mount Soil Profiles

SOIL and water conservation nowadays comes a lot easier to students in the Sanford, Maine, junior and senior high schools, thanks to Explorer Post No. 324, York County District, Pine Tree Council. When teachers asked them for help in explaining the fine points of "topsoil," "subsoil," "erosion" and similar matters, the boys-in-green found a way to expose such mysteries right in the classroom.

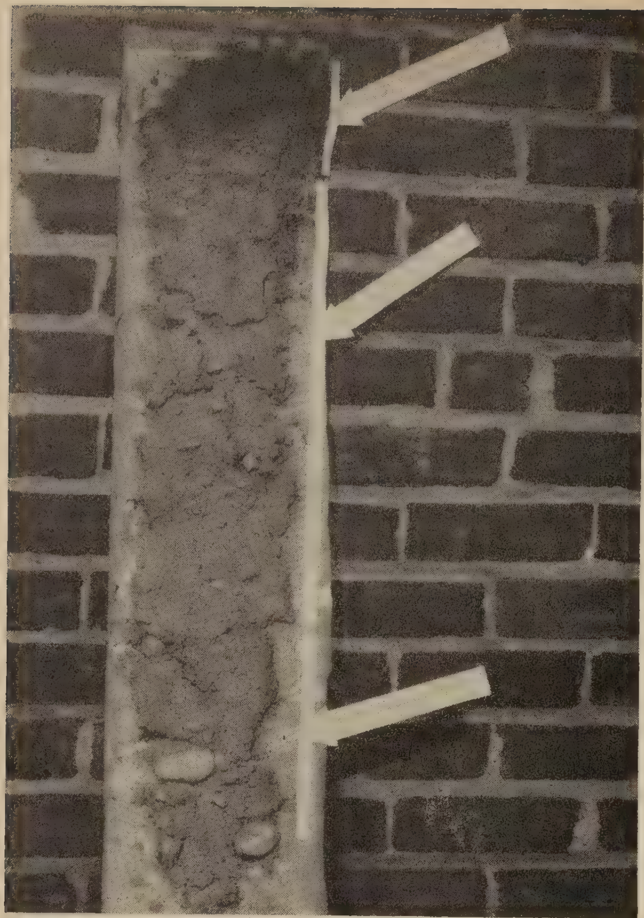
Here's how they mounted "soil profiles"—cross sections of earth—with the guidance of Sheldon Michaels, post adviser. The latter is a surveyor for the U. S. Soil Conservation Service.

First, the boys assembled the following materials:

1 piece 36 inch x 4 inch pressboard
1 piece 36 inch x 4 inch canvas
1 gallon clear acetate airplane dope
1 gallon dope thinner
1 2-inch paintbrush
1 1-inch paintbrush
1 garden spade
1 hunting knife

Explorers take look at soil profile.

Then, they hiked until they found a roadside cut-bank where raw earth was exposed. With the spade, they cut a fresh, flat, vertical face in the bank, slightly more than 3 feet deep and 4 inches wide. They used the 2-inch brush to saturate it with a half-gallon of dope and thinner, mixed half-and-half. When the soil-face



Monolith of Merrimac fine sandy loam mounted on presswood: topsoil, subsoil, and parent material.

dried, they applied the canvas strip—coated first with undiluted dope.

Freeing the profile from the bank proved to be ticklish. Knifing to a depth of about 2 inches around the canvas was fairly simple. But it took a couple of sad mistakes to show them that the final slicing should be upwards from the bottom. Otherwise the sample cracked to pieces.

The next step was to paint a liberal coating of undiluted dope on the pressboard and stick the canvas-mounted profile to it.

And finally they used the knife and the smaller brush to trim and smooth the profile down to the earth section securely held by the dope. With labels indicating the various, significant layers in the soil, and a screw eye installed in top edge of the board, the profile was all set to hang in the schoolroom.

The Sanford Explorers have a few extra hints to pass along in case your outfit wants to try this stunt: A full-size (8-foot x 4-foot) pressboard panel costs about $3, but suitable scraps are often available at school workshops, warehouses, and factory shipping rooms. Dope cost the Sanford Post $3.25 a gallon, and thinner, $2.50, at the local airport. This was plenty for two profiles. Model shops often sell smaller quantities. Surplus stores, upholsterers, and auto top shops are likely sources for canvas.

Cheap paintbrushes keep expenses down. Thinner readily cleans them of dope, and prevents them from stiffening during the various stages of the job.

There's a trick to that first step of applying dope-and-thinner to the soil. Splash or drip it on to start; when partly dry, it will make a better surface on which to brush.

Thorough drying of dope takes at least one hour. Since there are three applications in the above process, the Sanford Scouts used waiting periods to study wildlife borders, snoop around for erosion, and test soil samples with Michael's professional kit. And, of course, there was a bang-up campfire and cooking spree.

Success of the profiles gave another puff to the Explorers' reputation as red-hot conservationists. Their annual labors in planting thousands of trees throughout the York County Soil Conservation District long ago won the respect of grateful farmers.

Range Pitting

By HARLAN N. TULLEY

PITTING of native pastures is proving to be a boon to grass production in the short grass areas of Wyoming. Where blue grama makes up most of the grass and western wheatgrass is present but not abundant, the operation encourages the wheatgrass to become a larger part of the forage. This leads to higher production per acre, since the taller wheatgrass will produce 4 to 5 times the amount of forage that can be gotten from the short grama grass under the same conditions.

Rhizomatous-rooted grasses like western wheatgrass respond quickly to pitting, since

Note.—The author is range conservationist, Soil Conservation Service, Sheridan, Wyo.

One effect of pitting blue grama rangeland in windy country. The snow is held, to melt in warm weather and replenish soil's moisture supply. Taller grasses then send their roots and seeds into the small bare places provided by the pits, and thus increase desirable grasses and multiply volume of forage.

the underground rootstalks grow into the pits, where conditions are right for sending up new plants. Bunch grasses do not react to pitting this way because they depend on seed to make new plants. Their response is more in the nature of increasing the size of plants already there, which in turn means more forage produced.

Pitting can be done at the rate of about 3 to 5 acres per hour depending on how rough the ground is. If there already is a fair cover of native grass it is better not to seed with the pitting, since the native grass will respond first and crowd out any seedlings that may survive from whatever is sown. Pitting can be done at any time the ground is not frozen. It is best to pit just prior to the time that general rainstorms can be expected. This will get the vegetation growing in the pits and lessen the possibility of wind erosion damage.

Pitting is a suitable practice on any rangeland with fair to good forage cover, moderate slopes, and deep loamy soils. It is there that the best results are obtained. It encourages the mid and tall rhizomatous-rooted grasses to increase on land where short grasses predominate. Pitting on shallow, steep, or sandy soils is not advisable because the beneficial effects of increased moisture penetration are limited by the character of soil or topography.

The pits will begin to slough in within 2 years, and in about 5 years they become almost invisible. The improved soil permeability to which they have contributed will continue to be effective much longer than that. And the increased plant growth and vigor will help to retain this desirable condition.

It is necessary to protect the pitted land from grazing during the first two growing seasons after treatment in order to get the best increase in new plants and in plant vigor. Fall and winter grazing, however, is not detrimental. Records on pitted land in Wyoming show that infiltration of rain and snow water on short grass range is increased about 50 percent, and the grazing capacity is increased about a third over land not pitted.

BETTER ROAD, FEWER MOSQUITOES!—The newly completed Mexican Field Drain near Los Banos, Calif., is a good example of happy results from cooperation. Twenty-five farmers, working closely with county, state, and federal agencies, improved 974 acres of good farmland by drainage, eliminated a severe mosquito menace, and saved farmers $4,000 of the cost.

The Mexican Field Road was in poor condition. The Merced County Board of Supervisors decided to abandon it unless landowners could keep drainage water out of the borrow pits.

To meet the double problem of saving the road and improving the drainage facilities, the farmers brought their problem to the Directors of the Los Banos Soil Conservation District. The latter, using the services of engineers of the Soil Conservation Service, developed a plan that would cost the farmers $7,000. It was then that the Merced County Road Department, the Merced County Mosquito Abatement District, and the Agricultural Stabilization Committee lent their assistance.

The result was that 3¼ miles of drainage ditches, 3½ feet deep, were dug for an outlay to farmers of $3,018, a saving through cooperation of $4,000.

Pleased with completion of Mexican Field Drain: Henry Armstrong, road department; Dale Burnett, Soil Conservation Service; Sylvester Cardoza, chairman of farmer group; Roy Gondolfi, contractor.

Yield Triples

By KEITH J. DAMPF

THREE bales of cotton to the acre, where one used to grow!

This is the result of a complete soil and water conservation program on the farm of Eddie Manthei, of Seven Rivers Community, near Artesia, N. Mex.

"Last year," says Manthei, "on leveled ground I had 20 acres of cotton following alfalfa that made 3 bales to the acre. On remaining 36 acres cotton produced at the rate of 2½ bales to the acre."

His conservation plan, worked out with the Central Valley Soil Conservation District, calls for consecutive years of cotton following alfalfa. Then the land is seeded back to alfalfa while another alfalfa field is plowed up and planted to cotton. The alfalfa is fertilized each year with 150 pounds of 45 percent phosphate.

There are 160 acres in the farm, 145 acres under irrigation. This year 51 acres are in cotton and the remaining 94 irrigated acres will be in alfalfa.

In 1950, Manthei had a hillside field impossible to irrigate. He asked SCS technicians for assistance. As a result, the 44-acre tract was leveled. Today, this land is making some of the best crops in the Seven Rivers area.

"I was almost at my wit's end before that hillside was cut down into benches," Manthei recalls. "Water started from the ditch and actually washed away a lot of topsoil while it was pouring down the hill to the low end of the field. The top part of the tract got little water below the surface, while the lower end became waterlogged."

Twenty-four more acres were leveled in 1951, and 7 acres this year. The remainder of the farm is very nearly level, but Manthei plans to have some leveling done on more acres anyhow.

No water is wasted. From the time it is pumped from the ground until it is soaked up by the land, the water is under perfect control.

The high yield of cotton results from a complete conservation program, which includes land leveling, proper application of water, rotation, and fertilization.

Note.—The author is work unit conservationist, Soil Conservation Service, Artesia, N. Mex.

Manthei has one hand on bench leveling, one on border, to show height of border.

Ranchers Go to School

By THOMAS E. MULLINGS

RANCHERS of northeastern Colorado are going to "grass schools" to learn how to improve the management of their ranges. The idea started with Kenneth Conrad, who ranches in the sandhills northwest of Wray.

Conrad had been carrying on a range improvement program on his own ranch for several years, in cooperation with the Northeast Yuma County Soil Conservation District of which he is a supervisor. And he recently had attended a training session conducted by the Soil Conservation Service.

The schools developed as a cooperative enterprise of the Soil Conservation Service, the Extension Service, and the soil conservation dis-

Note.—The author is work unit conservationist, Soil Conservation Service, Wray, Colo.

tricts in Yuma County. The First National Bank of Wray helped stir interest, and the county agent helped with organization and promotion.

Since many ranchers found it difficult to meet for more than a day, it was decided to hold a series of night meetings at the centrally located Eckley High School. Articles appeared in newspapers. Post cards went to ranchers inviting them to attend. The school was set up to run 5 weeks with each session taking 2 hours. Instruction was handled by Soil Conservation Service and Extension Service.

Identification of native grasses came first. Growth characteristics, grazing, and indicator value of each grass were discussed, followed by a consideration of its adaptation to various soils, and the characteristic vegetation of local range sites in excellent, good, fair, and poor conditions.

Later, attention was given to the relationship between roots and top growth, and to the influence on growth of the degree and season of grazing. The importance of plant vigor and ground litter was stressed from the standpoint of forage production, as well as their bearing on runoff and erosion control.

The use of key species in determining proper utilization and the value of occasional deferment and seasonal adjustments of pastures was brought out. One session was devoted to grass seeding. Mechanical treatment of rangeland also was covered. Forage and beef production as related to range condition—the dollars and cents angle which vitally affects every rancher—was the main topic at the concluding meeting.

The instruction was handled by Thomas E. Mullings, SCS work unit conservationist with the Northeast Yuma Soil Conservation District. He was assisted by William Chandler, county agent, and Conrad, the rancher. George E. Bailey, work unit conservationist with the Hale Soil Conservation District, spoke on grass seeding. Ranchers and farmers participated freely. Several good ideas emerged out of the experiences of ranchers in meeting certain vexatious problems on their range.

Attendance ran from 40 to as high as 75—significant, in view of the long distances that many ranchers had to drive. The attendance represented a good cross section of Yuma County; some came from as far away as Nebraska and Kansas. Interest now is developing in holding similar schools in other portions of Colorado and in Nebraska.

While it is recognized that programs of this type are not substitutes for on-the-ranch technical assistance, it is felt that they are valuable in putting across some of the general principles that have wide applicability. Possibly their greatest usefulness is in whetting interest in the need and worth of good range management.

Typical sandhill range in Colorado.

SPECIAL RECOGNITION.— Gaylord H. Wisner has received a Community Service Award from the Kennett, Mo. Chamber of Commerce. As work unit conservationist, Wisner heads a staff of local Soil Conservation workers which has been cited frequently for outstanding accomplishment. The Dunklin County Soil Conservation District won in the 1954 Goodyear Conservation Awards Program and in 1953 was area winner of the St. Louis Globe-Democrat Soil Conservation District Awards Program.

Jack Stapleton, Jr., chamber president, presents award.

The Kennett Chamber of Commerce inaugurated a radio program known as "Man on the Farm," the object of which is to raise individual farm income at least $500 annually in their trade territory.

REVIEWS

LA CONSERVACION DEL SUELO—PROBLEMA NACIONAL. (The Conservation of the Soil—A National Problem. By Carlos Roquero de Laburu. 32 pp. Illustrated. 1954 Spain: Ministerio de Agricultura, Direccion General de Coordinacion, Credito y Capacitacion Agraria.

IN reading this publication, one is reminded of USDA Circular No. 33, "Soil Erosion A National Menace," by Bennett and Chapline which was published in 1928. My impression, based on a brief visit to the country, is that the soil conservation program in Spain now is in much the same position that ours was in 1928, at least as far as the agricultural land is concerned.

This publication is written in an easy, familiar style. Many of the points are brought out in question and answer form. It is well illustrated and contains two photographs by the Soil Conservation Service showing contour farming. One of these photographs formed the basis of the colored drawing which is on the front cover.

The seriousness of the erosion problem is pointed out and the fact is emphasized that once the soil is washed away it is gone forever. Then, various methods of controlling erosion are discussed. Much of this material is very familiar to us. However, I am sure that it will be very helpful and instructive to the Spanish farmers.

One problem in Spain, as in many of the European countries where the land has been cultivated for thousands of years, is the extreme division of the land into small parcels. We have not had to contend with this in this country. For the most part, the parcels are long and narrow, running up and down hill because the land at the foot of the slope is usually better than that farther up and none of the heirs wishes to take the poorer land. The strips have become so narrow that it is impossible to cultivate them except up and down the slope, which further aggravates the problem. A law was passed in 1952 which prohibits further division of the land but there is still a very difficult problem of dealing with the situation that exists. For example, the author showed me a map of the holdings of one man who owned about 250 parcels with a total area of only 46 acres.

This publication does not attempt to go into the subject of land classification. Dr. D. S. Hubbell, who was in the research work of the Soil Conservation Service for many years, was in Spain last summer and helped lay the groundwork for a land classification system suitable to the needs of the country. This is necessary in order that the conservation measures be tailored to fit the needs of the land.

—HOWARD E. MIDDLETON

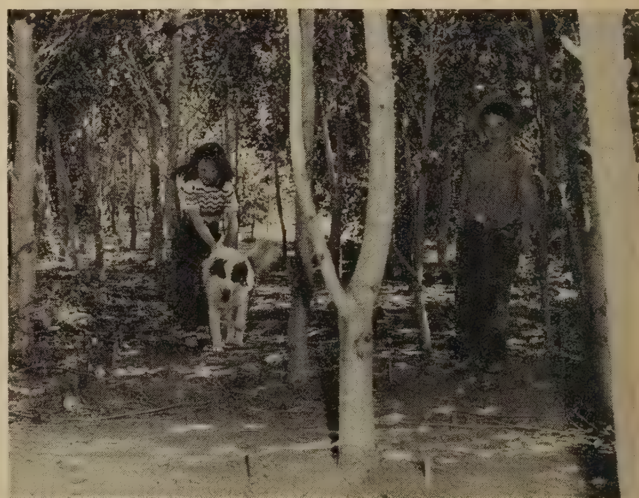
CAN BE PURCHASED.—Farmers, district supervisors, and others are welcome to subscribe to SOIL CONSERVATION Magazine. Price is $1.25 per year. (See inside of front cover.)

TREES AGAINST THE WIND.—In 1947 H. B. Ross, 25 miles east of Jordan, Mont, planted 3 rows of trees on contour terraces. The layout of his farmstead made it impractical to have these plantings where they would serve as a windbreak for his buildings so he planted them there where they could be watered from a storage dam and used to protect his garden.

He also planted about 1,000 cottonwoods and willows along the high water line of a series of small ponds near the house. He has since supplemented both plantings and has had excellent survival in all. The contour plantings have at all times been cultivated, hoed, and pruned but the cottonwoods required hoeing only the first 2 years. A 4-inch pipe provides supplemental water when needed. There are at present about 5 acres in these plantings and Ross plans to plant another 5 acres in the near future.

About 100 bushels of wild and hybrid plums were harvested in 1954. Orioles, goldfinch, thrush, and other birds not usually included in our prairie birdlife are annual nesters here.

Contour windbreak in 1951: left to right—plum, ponderosa pine, blue spruce.



Jack and Margaret Ross playing in cottonwood grove. Sage chickens nest here, as well as pheasants and Hungarian partridges.

Farmers study soil profile. They consider ease with which land can be stirred, whether or not it will take water readily, how tough is the subsoil, the depth and richness of the soil, the extent of erosion, and what conservation practices should be applied.

LAND JUDGING APPLIED.—Farmers and ranchers are beginning to put the knowledge they are gaining through land judging to work on their own farms, says Edd Roberts, Extension soil conservationist, Oklahoma Agricultural and Mechanical College.

He cites Don Stapleton, of Cordell, Okla., as an example. Stapleton states that he did not realize what was meant by using land according to its capability until he attended the first land judging school held in Washita County. He now has shifted several acres from cultivated land to grassland farming, and is cooperating in the soil conservation district program.

Roberts also reports Eldred Sasseen, of Dill City, Okla., as another farmer who has gained valuable experience from the land judging events and as a result is doing a better job of conserving his land. Sasseen is chairman of his local soil conservation district board.

According to Roberts, land judging contests have been held in all counties in Oklahoma. Dates for the National Land Judging Contest, sponsored by WKY and WKY-TV of Oklahoma City are April 28, 29, 30.

REPORT FROM INDONESIA.—About 30 percent of the Java forest has been removed in the last 15 years, leaving the land open to floods and soil erosion, according to George Bowers, soil conservation specialist. The Land Utilization Bureau and other Ministry of Agriculture agencies are taking steps to apply erosion control and correct land use practices.

Bowers is working with the bureau under the Foreign Operations Administration technical cooperation program. He explains: "Population in Indonesia, as in many other countries in the world, is increasing at a very rapid rate. In order to grow more food, people are cutting the trees from the steep land that only a few years ago was in a good protective forest. In many areas they are also removing perennial crops such as tea, coffee, and rubber that provided good protection to the land."

HISTORICAL NOTE.—This July issue of SOIL CONSERVATION Magazine completes 20 years of continuous publication. The same editor has served throughout.

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OFFICIAL BUSINESS

Water Reclaims Seep Land

By ROBERT L. TRESLER

"HOW else can you reclaim seep land, except with water and the right kind of grass?" asked Reed Thomas. This was in answer to another question: "Why do you irrigate your new seedlings of tall wheatgrass so much?"

Reed Thomas is in Wyoming's Shoshone Soil Conservation District. His fields of tall wheatgrass are convincing.

His farm forms the shore of a shallow salty lake about 3 miles south of Lovell. It had been a long time since the wet land had grown a really good crop. But in 1952 Reed planted a small acreage of wet salty land to tall wheatgrass, using seed from seed plots established on neighboring farms. That first year he had to part the foxtail and the seepweed to find the grass. This year, however, tall wheat is dominating the field. Thomas was so enthused that last spring he plowed even saltier land, next to the lake. He seeded tall wheatgrass and started irrigating often and lightly, using corrugations. By August he had irrigated eight times and had a beautiful stand.

Tall wheatgrass is a surprising plant. It seems to grow as well on wet, salty land as on what is usually considered good land. It will grow where there is so much salt that other crops die. Even though it grows tall and rather coarse, it is a most usable grass. It is even preferred by livestock to other pasture grasses at certain times of the year. Cut at an early stage, it makes good hay.


Portion of field in June 1953; salt on surface, unstable soil, weeds dominant.


Same field late in August. Tall wheatgrass has done its job.

Light, frequent irrigations are one of the secrets. Even though there is a very high water table, it still is necessary to irrigate to dilute the salts and prevent the forming of a crust. It is also essential to prepare a good seedbed, by killing out the present vegetation and disking it down firmly. Almost all salty fields are dry enough sometime during the year to do this. The time of seeding is not so important as that a good seedbed be prepared and the seedlings irrigated often.

Note.—The author is agronomy specialist, Soil Conservation Service, Douglas, Wyo.